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1951 Vol. XLIX

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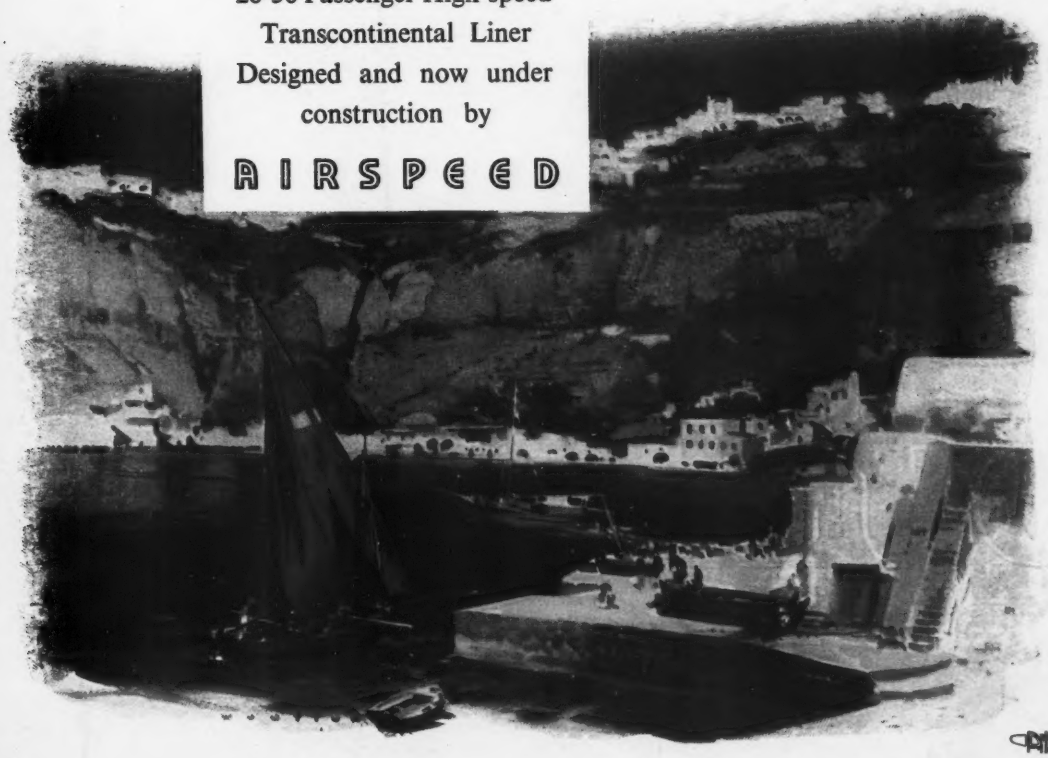

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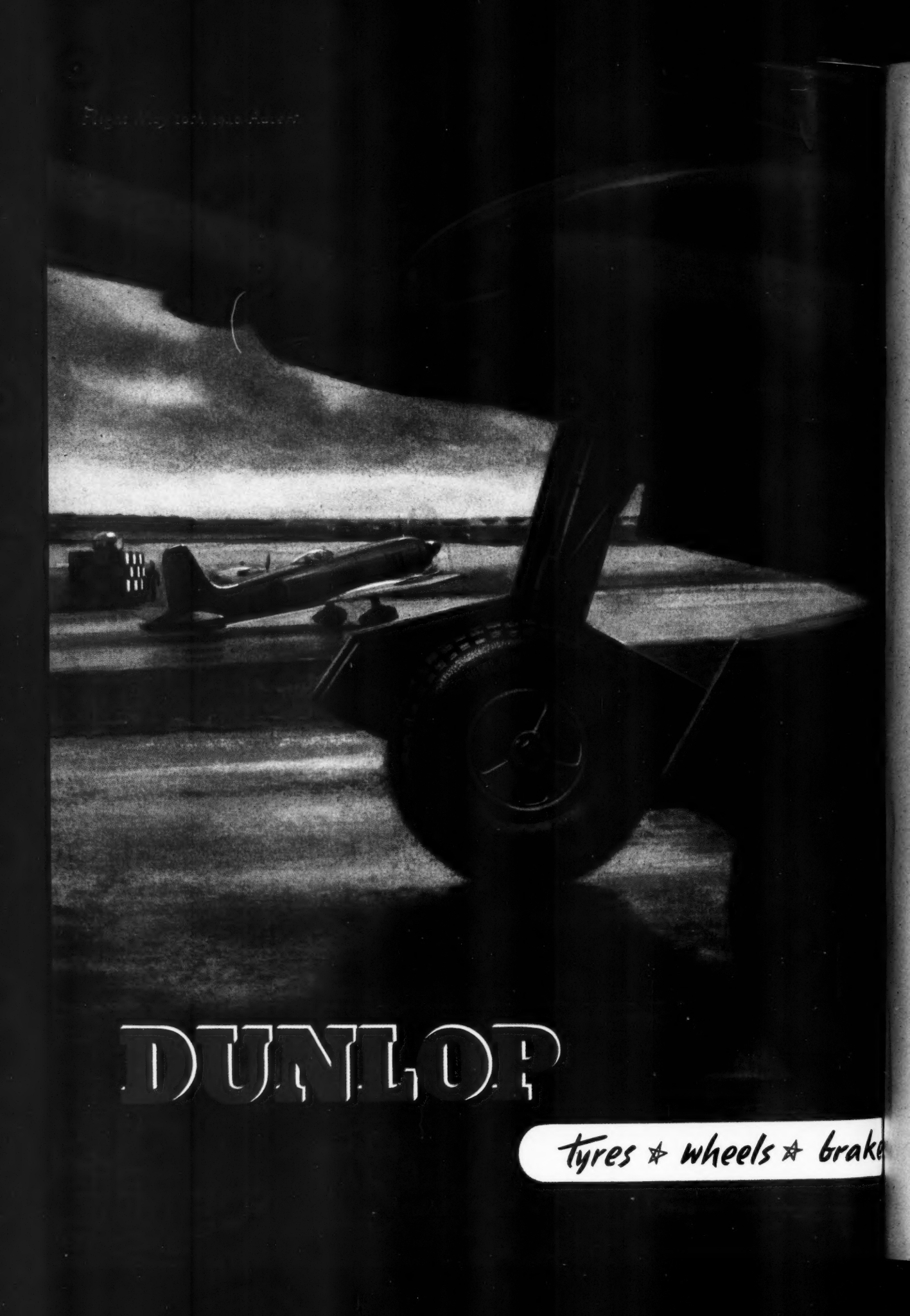
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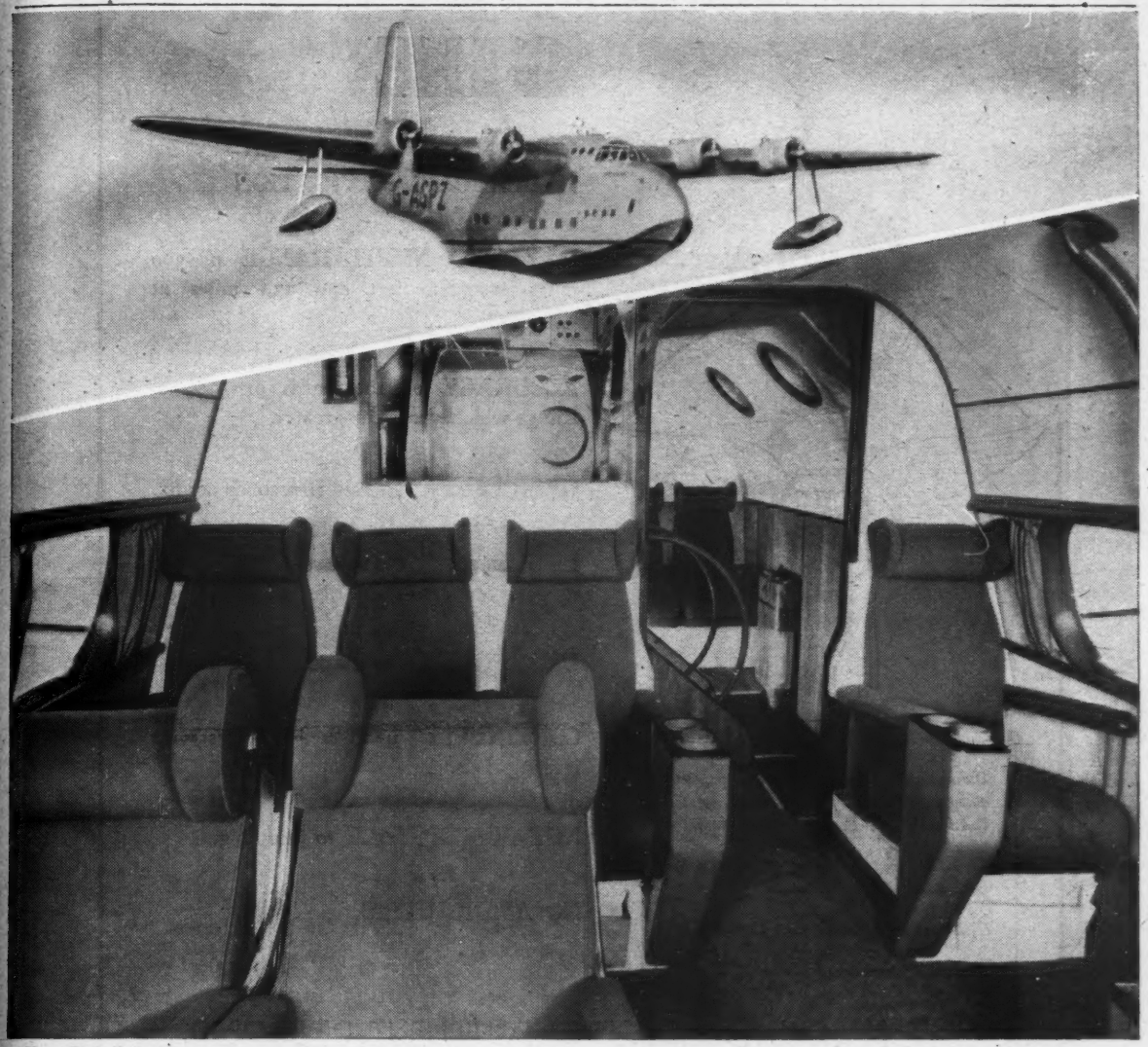

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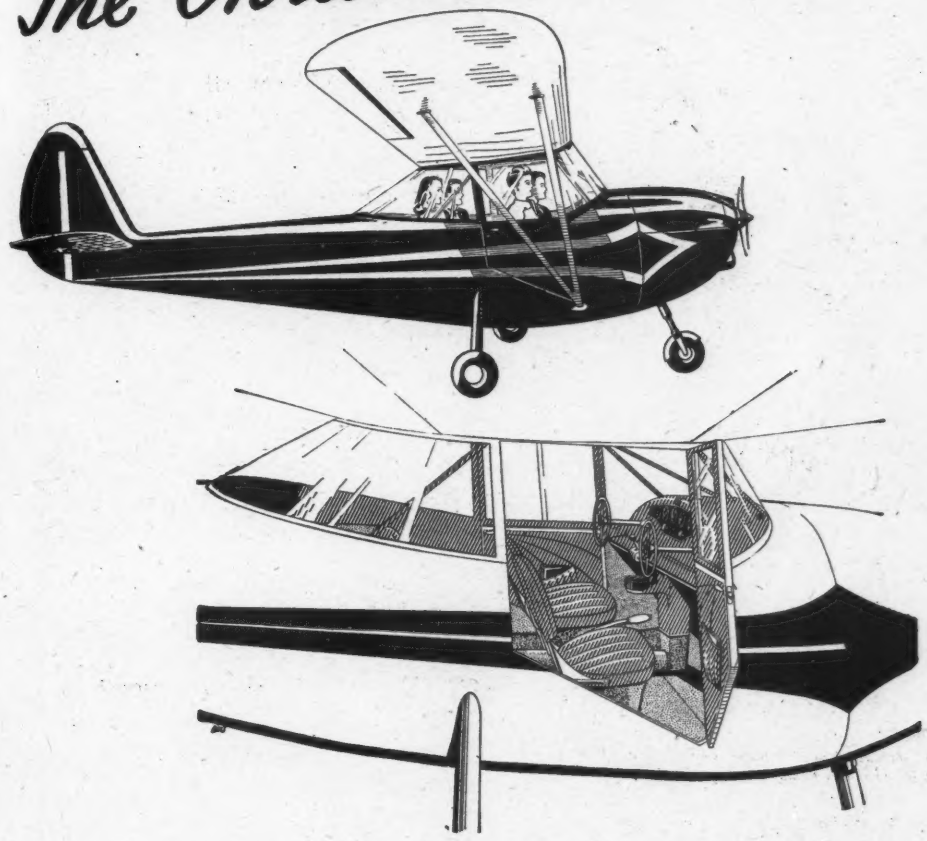

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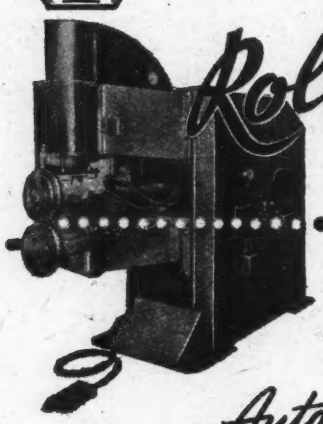

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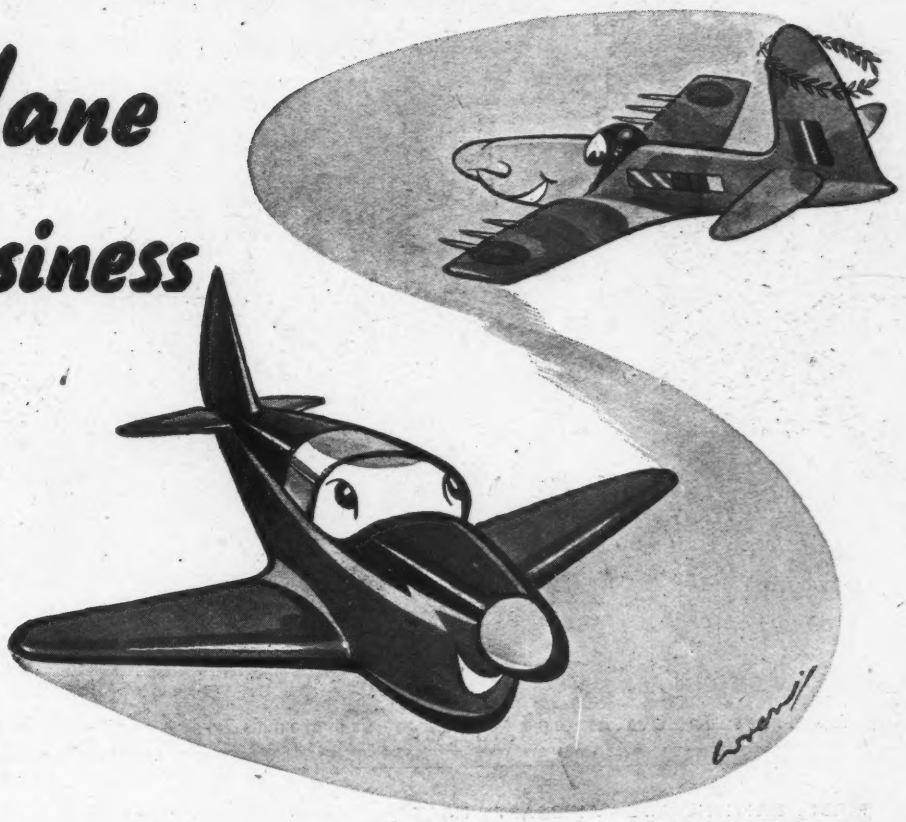

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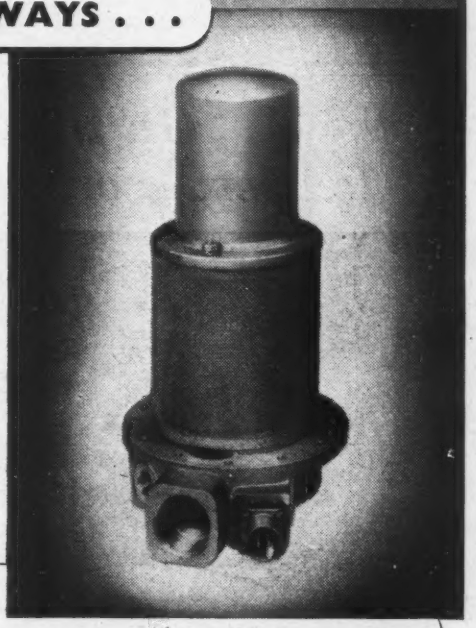

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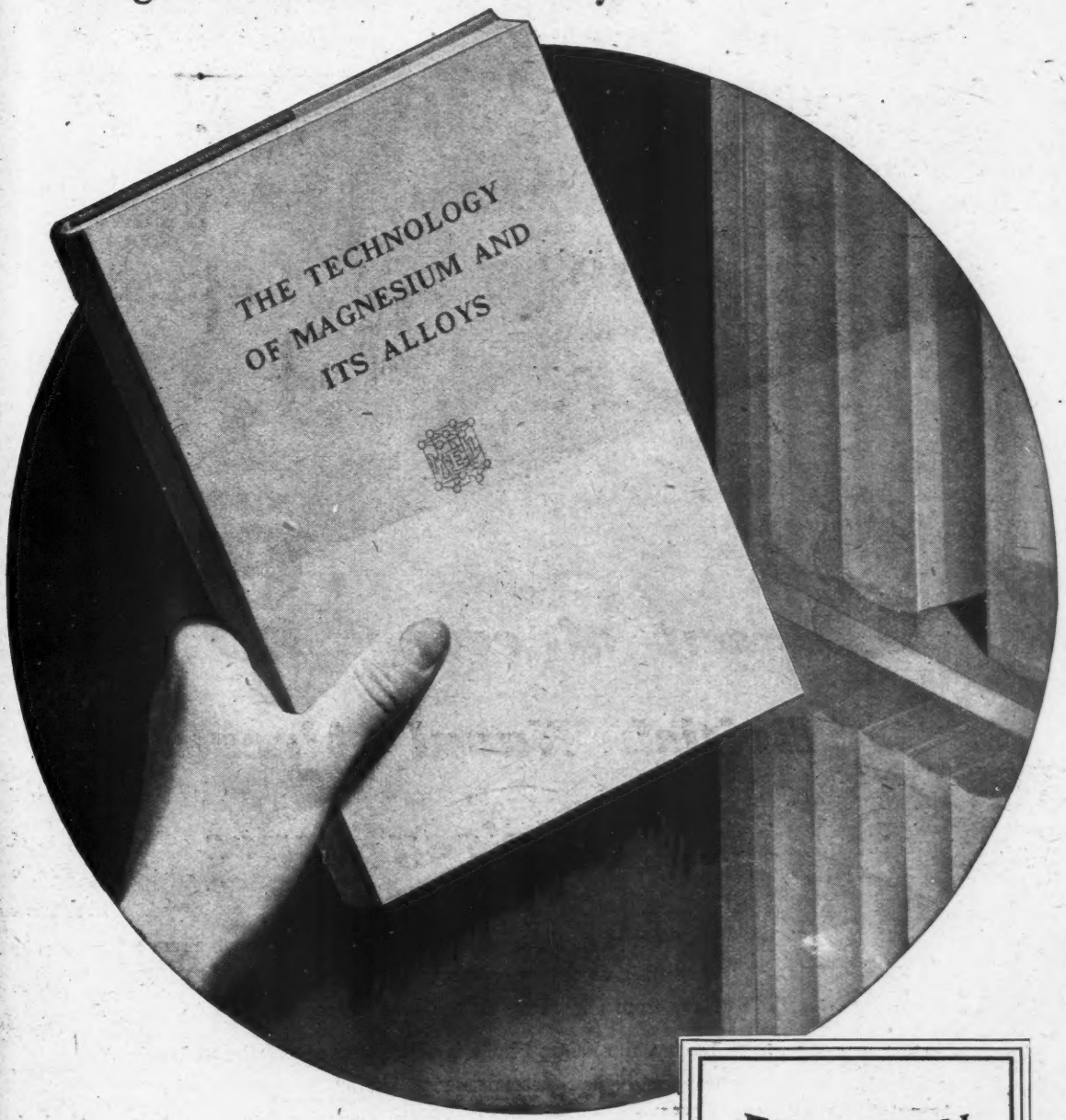

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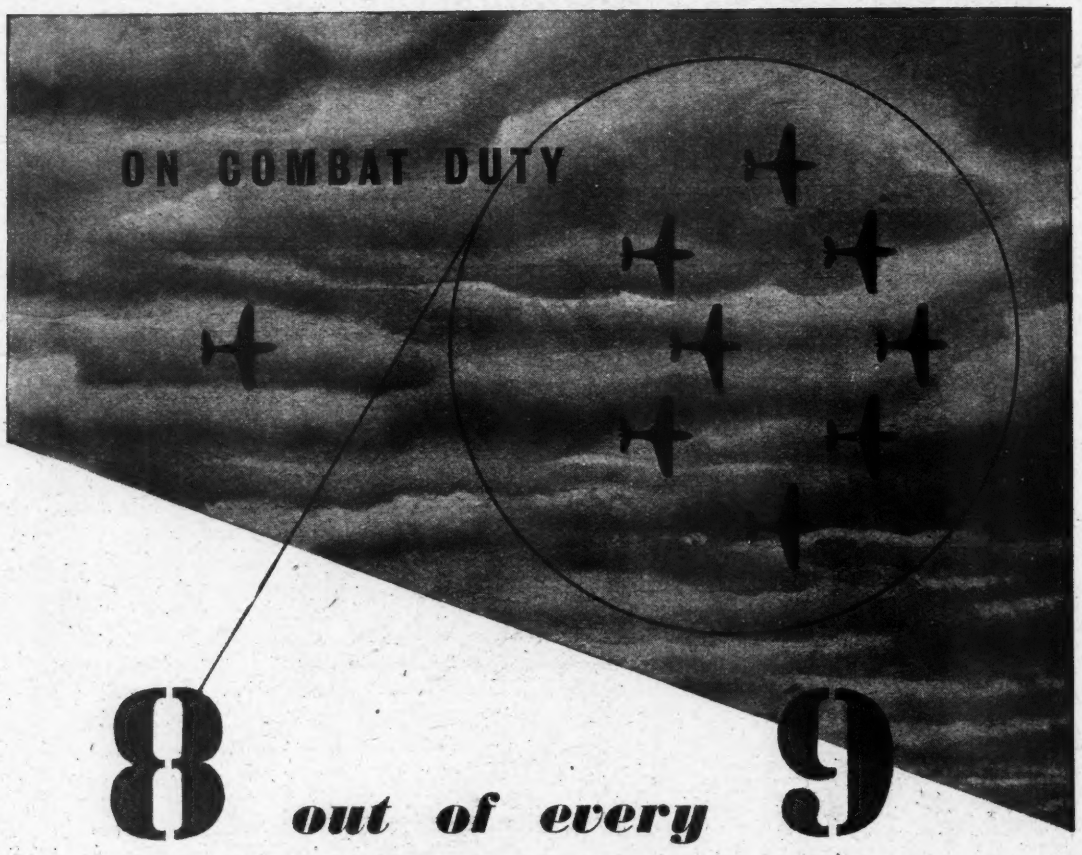

8 out of every 9 British Naval Aircraft were Fairey types

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The Outlook

Atmosphere Control

THAT Great Britain is a long way behind in the production of commercial aircraft is an impression which has, unfortunately, become very widespread both at home and abroad. The fact that British designers and constructors had to start from scratch when the war finished provided the foundation for this idea, and it is true that there were delays—inevitable in the circumstances; but the way in which the initial handicap has been reduced since then is not generally realised. In spite of all difficulties, and some of them have been formidable, work has gone on quietly and without fuss behind the scenes. Of setbacks there have been many, but in the aggregate, progress has been good, far better than one could reasonably have expected.

An excellent example of the sort of development which has taken place is provided by the Avro pressurization research described in this issue. Already this has resulted in the satisfactory test flying of the first Tudor I production machine with full atmosphere control. In what is, in the circumstances, an incredibly short time, the numerous problems have been solved, thanks to the close collaboration between the Avro and Westland firms, the latter of which has been responsible for much of the equipment used.

One very important feature of the Avro results is that Mr. Chadwick and his staff have been able to incorporate cabin pressurization in the Tudor I without an undue weight penalty. The pessimists have been in the habit of pointing out that although atmosphere control might be very desirable, it would entail so much extra weight that operators would hesitate to sacrifice the payload involved. The Tudor I is proof that clever design can overcome even this objection, a fact which should encourage other designers, and a very gratifying aspect of the whole matter is that Avros are making their results available to the rest of the British aircraft industry. Thus progress should be rapid, and the day of travelling in real comfort at high speed has been brought much nearer than could reasonably have been expected, even a short time ago.

Fool-proof Flying?

THIS week, in his American Newsletter, "Kibitzer" takes a gloomy view of the future of private flying. He suggests that the American manufacturers who are launching into large-scale production may easily burn their fingers with the more or less orthodox types of light aircraft which they are putting on the market.

While we think our contributor is unduly pessimistic, there is no gainsaying the fact that piloting the light plane which has been the usual type to date is far more difficult than, to take "Kibitzer's" example, driving a car. We have always held the view that the two are not comparable, and that if one *must* make a comparison with any other form of locomotion, flying has much more in common with yachting than with motoring.

As for our contributor's argument that machines must be produced which are really stall-proof and spin-proof, considerable progress has already been made in that direction, both in America and in this country. It should not be impossible to come close to achieving this. Placing the centre of gravity well forward and limiting elevator control to the point where it is not powerful enough to stall the machine suddenly and viciously is one way. What has been termed the "two-control" system avoids the most "unnatural" aspect of control co-ordination. But circumstances may arise when it would be a great advantage to be able to do a deliberate sideslip; this the two-control type cannot do, nor can it do a flat turn.

With one argument put forward by "Kibitzer" we cannot agree at all. He pleads for landing and slow-flying speeds of 20 m.p.h. Unless the flying controls are vastly different from any in use to-day, such low speeds are likely to be a source of danger rather than

of safety in anything but a flat calm or in a wind which does not vary either in force or in direction. Unfortunately such conditions are rarely encountered.

Aircraft and Marine Radio

ONE of the objects of the three-week International Conference on Radio Aids to Marine Navigation, briefly reported on page 501, is to prepare a provisional case for international standardization of radio navigational systems with special reference to the problems of the allocation of wavelengths. The conference, which has been called by the Ministry of Transport and has the full support of the Admiralty and Mercantile Marine, is bound to have a direct effect on future decisions to be taken in connection with international aircraft navigation, and its progress will be watched by airline operators.

The first experimental Consol R.D-F. station, was built for the Air Ministry at Bushmills, Northern Ireland, and is now ready for operation. Consol for aircraft or shipping is developed from the German Sonne system and its secrets may later appear as an important item in the list of reparations. It provides an automatic long-range fix service, and all the operator need do is listen out on 1,140 metres for the morse signal 7-H-7 and then count dots and dashes for sixty seconds. Two counts from different transmitters provide a fix.

The import of the completion of a prototype standard marine radar set built to the specification of the Admiralty Signals Establishment will not, we hope, have escaped the notice of aviation authorities, for the navigational requirements of civil airline operators are not settled, nor the problems solved.

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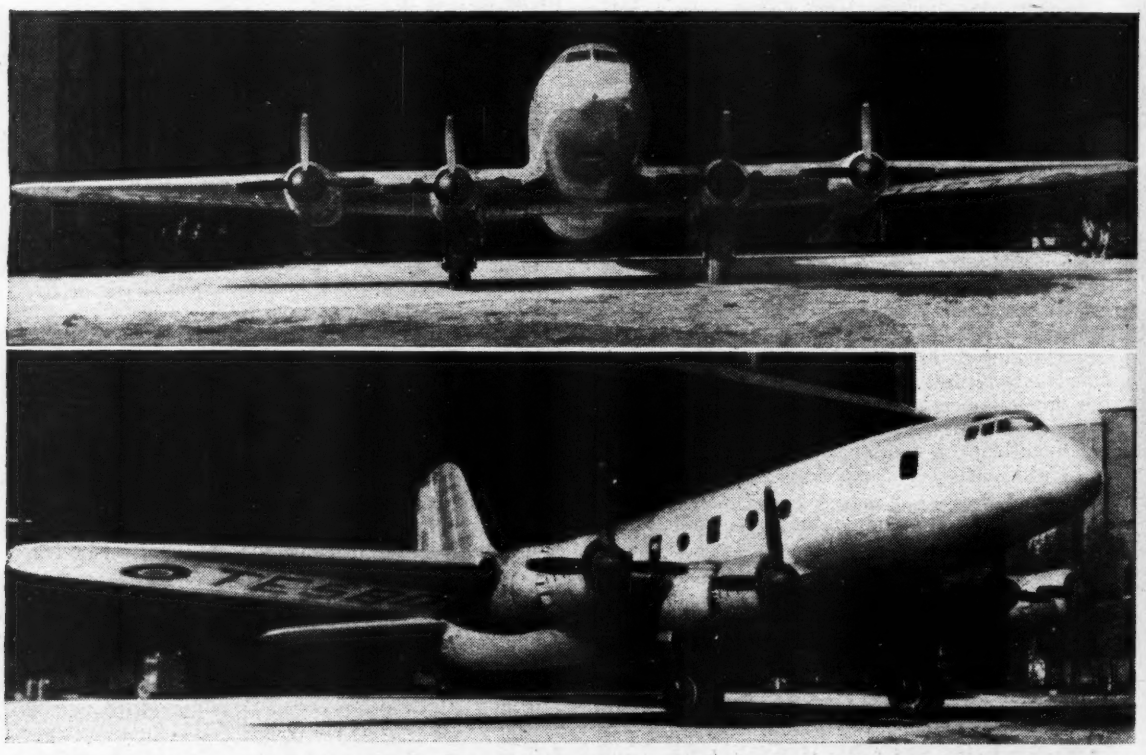
Charter Flying

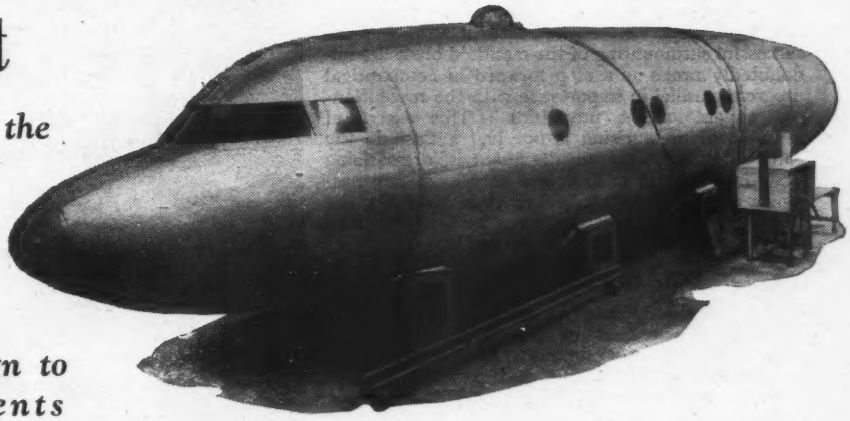
APART from the fact that it is good to see a start being made by private enterprise in the only field open to it, there is a deal of poetic justice in the formation of the new charter company, Skyways, Ltd., by Sir Alan Cobham and Brig. Gen. Critchley. Sir Alan was, before he introduced his schemes of refuelling in flight, a blazer of trails on the Empire routes, and General Critchley has had applied to him the term "filibustering." Sir Alan never tired of hammering home the point that commercial flying will not amount to anything until it ceases to be news, and General Critchley, whatever may have been his faults while he was with B.O.A.C., is a man of ideas and with terrific drive. Both are thus well fitted for guiding the operations of "tramp services." The scale on which the firm hopes to work is impressive, and we shall follow it with interest.



HANDLEY PAGE TRANSPORT. Two views of the prototype Hastings which, flown by Sqn. Ldr. Maurice Hartford, made its first flight at Wittering on May 7th. The type is in series production and is the largest transport yet to be built for the R.A.F No figures for the Hastings have been given, but the expected all-up weight of the Hermes, its civil counterpart, is 75,000 lb.

Pressurized Flight

Demonstration of the Avro Tudor I : Exhaustive Test Programme for Pressure and Strength : Considerations of Design to Meet Requirements



The full-scale test fuselage, *sans* centre-section, on which the pressure and strength test programme was carried out.

ON Wednesday, May 1st, we had the unique experience of flying at 25,000ft sitting in a beautifully upholstered armchair, smoking a cigarette and chatting comfortably with our fellow passengers. The cabin temperature was kept pretty constant in the region of 75 deg F, and from the lack of obtrusive noise and sheer luxury of travel, we might all have been sitting in a superbly appointed special train—apart from the utter absence of apparent motion. In point of fact, we were flying in the first production Avro Tudor I.

View of Tudor I interior looking forward. The air inlets can be seen at the base of the chairs and, top right, at the upper berth level. Air exit is by perforations around the central roof lights.

The average person needs oxygen at altitudes much in excess of 15,000ft. At still higher altitudes the lack of atmospheric pressure has pronounced and, in extremes, fatal effects on the human system. Yet here we were, nearly five miles up and with an outside temperature of −24 deg F (76 deg below freezing) being carried through the sky at 300 m.p.h. in the most luxurious form of transport man has yet devised.

To appreciate pressurized flight in its true perspective, it is necessary to have experienced normal flight at similar altitudes. The uncomfortable oxygen mask in which one's breath condenses, the penetrating cold, the frost-coated windscreen and windows—all these are relegated to the past by this magnificent British achievement.

Large-volume Difficulties

Readers will remember that articles on pressurization and allied subjects have appeared from time to time in this journal, the Tudor I aircraft being dealt with in the June 28th, 1945, issue, whilst the details of a typical cabin atmosphere-conditioning system were included in the January 31st, 1946, issue. The latter article was not only an objective survey of the subject *per se*, but also a review of the constructional details and operational functions of the several components employed.

As with many other aspects of modern aeronautical practice, cabin atmosphere conditioning (which includes pressurizing) has, as a result of the past discussion of the subject, become almost automatically accepted by the majority of interested people without question, and too often without consideration of the immense difficulties involved. This is all rather curious when it is realised that, until now, the real thing has not existed. Small-volume pressure cabins were, of course, employed during the war by special high-altitude versions of Spitfires and Mosquitoes, and, as such, did not introduce too many difficulties of execution. In aircraft such as the Tudor I (and II), involving very much larger volumes, the difficulties encountered

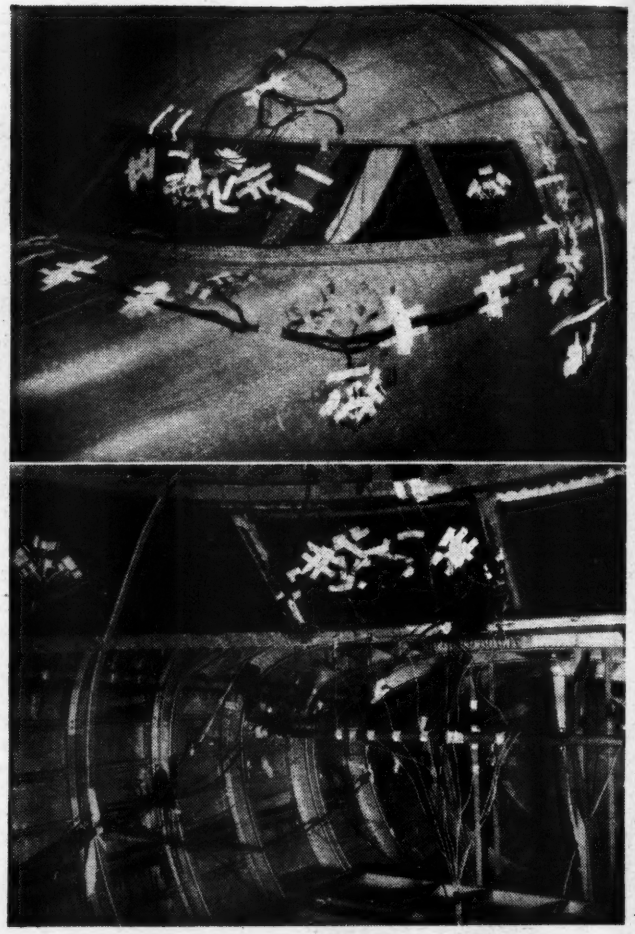
PRESSURIZED FLIGHT

are, however, magnified in somewhat more than direct proportion to the increase in size, and the successful surmounting of the manifold obstacles undoubtedly ranks as a step forward in aeronautical progress parallel in importance with the revolutionary advent of jet propulsion. This successful example of pressurizing is not just a flash in the pan; let there be no mistake about it, pressurizing has come to stay, and, before very long, any passenger-carrying aircraft, other than those in the "private" class, will not have a hope of being sold unless it has a pressurized cabin.

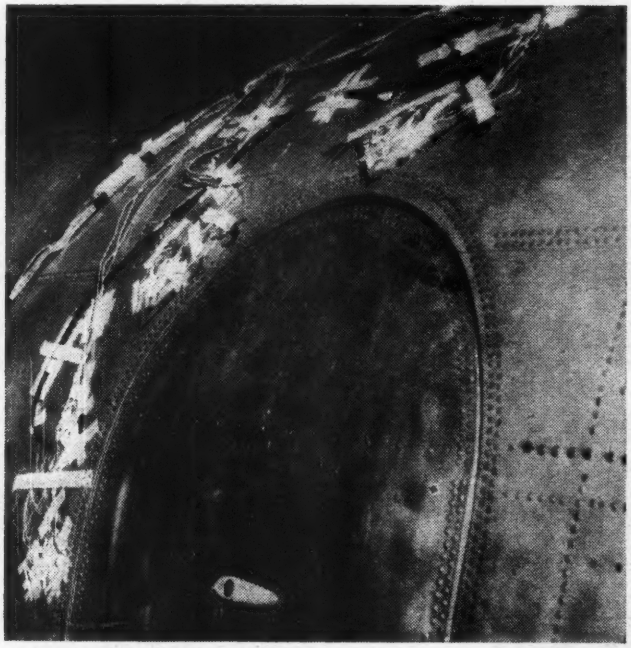
Rate of Pressure Change

Quite obviously success such as this is only obtained at the expense of some considerable effort, and A. V. Roe and Company, Ltd., have been rewarded for their intensive and painstaking past work by becoming leaders of the world in providing a reliable and highly efficient cabin atmosphere-conditioning system for everyday use. On the flight mentioned above, Captain Orrel, the Avro test pilot, took the Tudor up at a steady climb of 1,000ft/min, but the maximum equivalent rate of pressure change in the cabin was never more than 18oft/min, and no one had to "blow" their nose to "unpop" their ears. There was no physical evidence of changing conditions, and the passengers all sat and talked and smoked as though in a coach or train or ship—except that it was far more comfortable than any of these.

The system is such that, no matter what the actual speed of ascent or descent of the aircraft, the maximum rate of pressure change in the cabin will not exceed the equivalent of 300ft/min variation in height. Medical authorities are agreed that so gradual a change as this is absolutely safe for everybody—even though they may not enjoy good health. Further, to demonstrate the full qualities of the system only one of the two cabin blowers was employed during the flight. Perhaps one may here reiterate that the installation employed on the Tudors embodies duplication of all critical components, each one of which is capable of coping with the full load. Thus there is, in effect, a 100 per cent reserve safety factor—and very comforting, too.



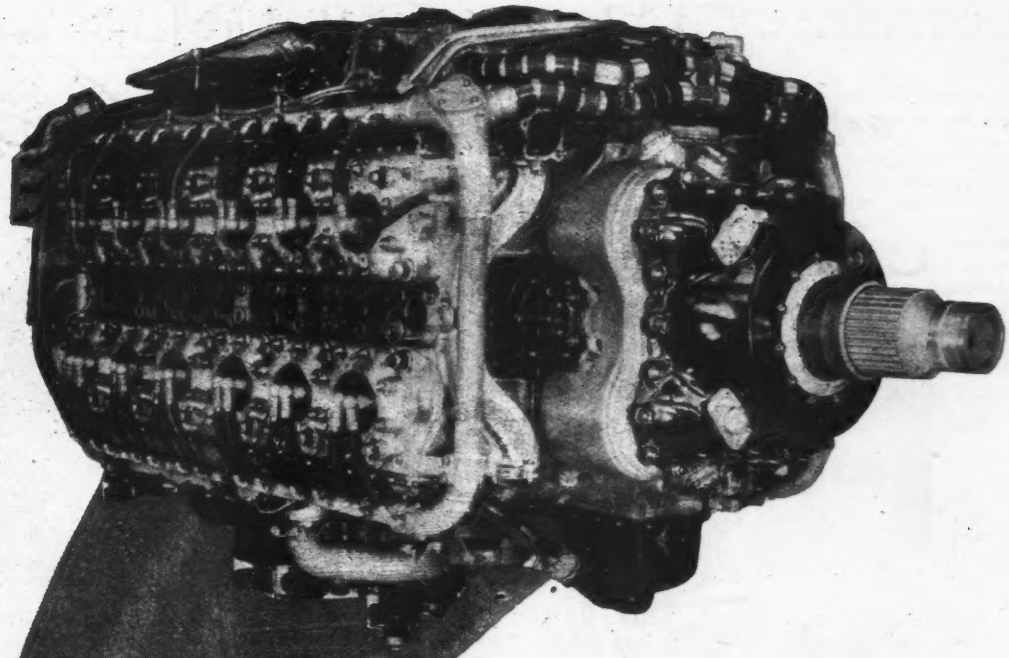
These complementary photographs show the attachment points and attendant wiring of the electrical resistance strain gauges around the cockpit rails and on the windscreen both internally and externally.



Attachment points of the strain gauges positioned externally around the top and forward side of the main entrance door.

Priceless Design Data

On the subject of safety, prior to the Tudor I undergoing her first pressurized flight, an extensive succession of physical testing was undertaken, which terminated in the static pressure testing of a full-scale Tudor I fuselage. The series of tests made on the fuselage were concerned both with determining the points and magnitude of leakage, and also the incidence and magnitude of developed strain at representative stations for given pressure differentials. From the fund of data so produced Avros have been enabled not only to confirm the excellence of the Tudor design for its intended purpose but, in addition, have gained priceless design data for future machines.



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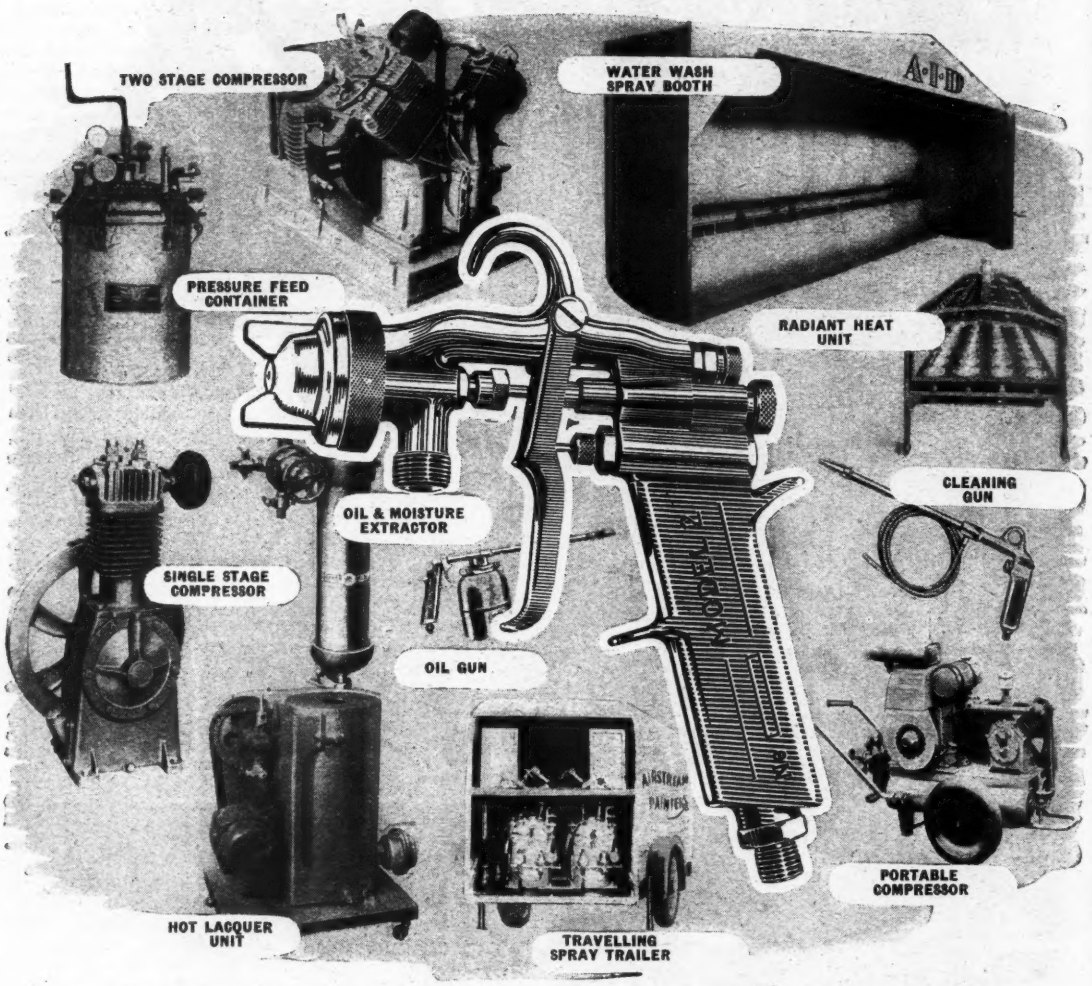

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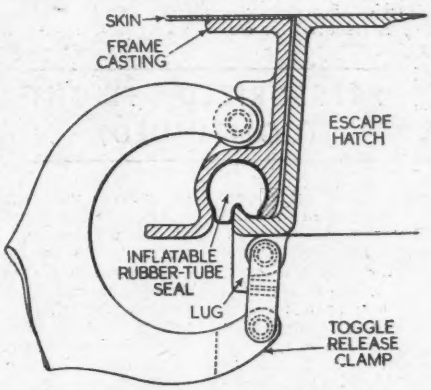
PRESSURIZED FLIGHT

It is probably pertinent to remark here that but for the modern development in electric strain-gauge technique, the stressing aspects of the test programme would have been immeasurably more complicated. It is also interesting, and extremely heartening, to note that the values recorded by the strain gauges proved that the calculated stressing of the fuselage structure at many points was pessimistic. From this one can obtain a pretty faithful indication of the quality put into the aircraft, for despite the design for ease of production, with consequent economy in first cost, and the very low percentage structure weight of the machine—with its influence on operative economy—the strength factors of the finished product are, in point of fact, greater than actually required.

Even with its pressurized cabin the Tudor I has a percentage structure weight lower than that of any of its contemporaries in the same field, and as a pressurized machine the amazingly low structure weight puts it in a class quite by itself. At the request of the Ministry of Supply, the benefit of Avro's work on pressurizing, etc., has been made available to the rest of the British aircraft industry.

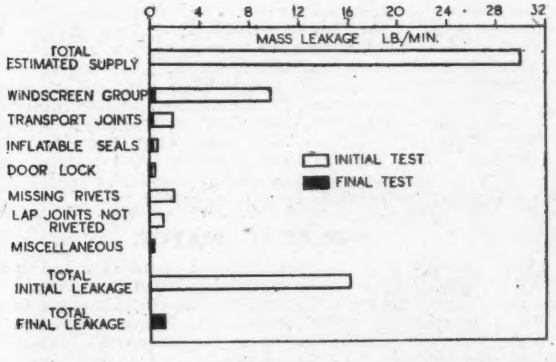
A detailed survey of the leakage and strength tests would, from consideration of space, be out of the question for publication in these pages. However, we can summarise the several tests and still obtain a good overall impression of their value. First, the leakage tests:—



Detail section showing typical usage of inflatable rubber tube to seal openings in fuselage. The inflation pressure of the tube is required to be somewhat above the internal pressure of the fuselage.

Detail Testing

Initial tests were confined to the determination of quantitative leakage through structural joints and riveted connections, and for this purpose a small 6ft high by 3ft diameter pressure chamber was made. Small test panels could be clamped over a rectangular cut-out in the chamber wall, leakage through the panel being investigated at a full range of pressures from 9 to 11 lb/sq in gauge, the latter figure corresponding to a factor of 2 on the maximum flight pressure differential of 5½ lb/sq in, equivalent to an 8,000ft cabin altitude at a true altitude of 25,000ft. Methods of reducing leakage through structural joints, with particular reference to skin laps and transport joints, were investigated with the following conclusions: (i) It was not necessary to seal the reaction heads of rivets, even where structural connections occurred; (ii) sealing structural joints by the use of a tape overlay was found to be unsatisfactory; and (iii) sealing structural joints by the internal application of a suitable mastic compound by spray or brush was considered to be an ideal method.



This linear chart serves graphically to illustrate the improvement in sealing brought about by the test programme. The final mass-leakage figure can be taken as representative of that applicable to the production aircraft.

At the same time a thorough investigation was carried out on the design and sealing of suitable control-rod glands, auxiliary fittings such as aerial mountings, pipe and cable connections and heater-duct joints, whilst the stability of re-entrant boxes under pressure was also considered. Satisfactory methods of sealing and stabilising were developed.

At this stage it was considered that some strength information was necessary, and a large test specimen was constructed, consisting of cylindrical shell 9ft in diameter, the method of construction simulating that of the Tudor I. The specimen was sealed in stages, using a mastic compound, and the mass leakage was determined at each stage at test pressures of 5½, 8¼, and 11 lb/sq in. From these tests it was concluded that the structure was satisfactory for strength from considerations of pressure, and the technique already evolved by small-scale tests on constructional sealing was broadly satisfactory.

As a result of the experience gained on these later tests a specimen of 10ft diameter was built up. The method of construction was again similar to that used for the Tudor I fuselage, and arrangements were made, by the use of suitable fabricated loading trusses, to investigate the effect on leakage of combined pressure and bending. The two cases were considered both separately and together, and leakage under fluctuating bending moments was also measured. Little variation of mass leakage occurred with the application of bending moments of various magnitudes, and the test series eventually developed into an investigation of strength.

Full-scale Testing

As a logical development from the foregoing tests, a programme of full-scale testing was undertaken, the fundamental object of which was to measure the mass leakage through a full-size fuselage at pressures corresponding to (i) a maximum flight pressure differential of 5½ lb/sq in; (ii) the maximum flight pressure differential plus 50 per cent, viz, 8¼ lb/sq in; and (iii) the maximum flight pressure differential plus 100 per cent, or 11 lb/sq in. Secondary objects of the test included the confirmation of results obtained during the preliminary research programme of sealing tests on small-scale specimens; reduction of the mass leakage to a minimum by the isolation and elimination of various points of leakage; indication of any necessary design modifications to improve sealing; provision of information on the application and sealing properties of "Peratol," which has recently been approved as the most effective sealing compound; and the determination of pressure to be maintained in the inflatable rubber sealing tubes at the major openings in the fuselage.

When this test programme was initiated there was no absolute information available on the allowable leakage through pressure cabins. Accordingly the reduction of leakage to an absolute minimum was aimed at, an arbitrary leakage of 40 cu ft/min at normal temperature and pressure (equivalent mass leakage 3.23 lb/min) being set as a criterion of reasonably small leakage for the test fuselage which, in fact, did not include the centre section of the aircraft as this was not available at the time.

The basic structure of the test fuselage included the

floor structure complete, and reinforcing members in the nose section. Main removable fittings such as escape hatch, astrodome and door were included, as information on the suitability of the inflatable sealing tubes was required, but minor cut-outs and fittings, such as those for electrical plugs, aerial fittings, etc., were omitted as having largely been tested as details.

A knowledge of both pressure and temperature variations is necessary for the accurate determination of mass leakage. For the measurement of pressure a mercury manometer was fitted calibrated to lb/sq in. For the measurement of temperature ten electrical thermometer bulbs were disposed along the inside of the fuselage at representative points. A suitable recording unit was developed by which the mean temperature of the fuselage interior could be determined to an accuracy of plus or minus 0.1 deg C. Such accuracy is essential for correct estimation of leakage, as a variation of 2 deg C in 20 minutes may involve an error of 10 per cent on small leakage figures if not taken into account.

PRESSURIZED FLIGHT (CONTINUED)

The initial tests on total mass leakage were excessively high being 16.1 lb/min at a pressure differential of 2¾ lb/sq in. This figure represents 53.6 per cent of the total available compressor supply of 30 lb/min, and was considered unsatisfactory for a specimen which excluded the centre section.

As the tests proceeded, major leakages at a number of points were successfully reduced to small proportions by the incorporation of various sealing modifications until, finally, the total mass leakage was reduced to 2 lb/min at a pressure differential of 5½ lb/sq in. This latter figure represented 6.67 per cent of the available compressor supply, and in so far as it complied with the arbitrary requirements of 40 cu ft/min, or 3.23 lb/min, the specimen could be considered to be satisfactorily sealed. The line chart gives an excellent indication of the progress made in reducing leakage between the initial and final tests.

The complementary programme of tests for strength from considerations of pressure had as secondary objects the verification of design stressing assumptions, and the determination of stresses at points where calculations tend to be difficult or unreliable.

Official Requirements

Strength requirements for pressure are laid down by the Air Registration Board under two heads, (a) proof pressure and (b) ultimate pressure. For the first of these the A.R.B. requirements quote a factor of 1.33 on the maximum flight pressure differential. At 5½ lb/sq in m f p d the proof pressure thus equals 7.33 lb/sq in, which must be withstood for one minute with no detrimental distortion. The requirements for ultimate pressure call for an ultimate factor of 2 on the maximum flight pressure differential; thus, ultimate pressure in the case of the Tudor I equals 11 lb/sq in.

Electrical resistance strain gauges were fitted at all critical points, particular attention being given to the nose structure and major openings in the shell such as the door, astrodome, and escape hatch. Three-gauge strain rosettes were used freely where doubts existed as to the principal stress directions. A certain proportion of strain gauges were placed at various points where stresses could be predicted by theory, in order to verify the assumptions made in stressing calculations.

Desynn electrical transmitters were disposed at various points along the specimen in order to record diametral strains. Particular attention was paid to the nose, where departure from circular sections and the incorporation of Triplex glass windscreens made this portion of the structure very critical. All major openings in the fuselage were closed and sealed by means of inflatable rubber tubes fitted in peripherical recesses at each joint.

Zero readings were taken at all strain and Desynn gauge positions, and the fuselage was then charged with air up to the required pressure; strain and Desynn gauge readings were taken at convenient increments of pressure. The fuselage was examined for visual signs of distortion, particular attention being paid to the nose section. All pressure was then removed and "zero" readings on the gauges were again noted. The fuselage was examined at close quarters both internally and externally for any signs of structural failure.

In tests No. 13 and 14 the fuselage was pressurized to the ultimate factor of 2 and successfully withstood the pressure of 11 lb/sq in. In test No. 13, with 11 lb/sq in held for 20 minutes, strain-gauge observations were made at 0, 3, 6, 9, 10, 11 and 0 lb/sq in. No structural failure or detrimental distortion of the fuselage was observed, with the exception that bearing failure had occurred at the blind holes in the entrance door-frame casting (magnesium alloy) which receive the steel locking pegs. The whole pressure thrust on the door is transmitted as shear to these four pegs which, in turn, exert considerable local bearing loads on the door-frame casting. To avoid this defect, steel insert bushes are fitted in the door-frame casting at these points to ensure additional bearing strength.

Windscreen Difficulties

In test No. 14, pressure was again raised to 11 lb/sq in, but as this test was performed in order to obtain final leakage figures, no strain or Desynn gauge observations were taken. At 11 lb/sq in the starboard Triplex windscreen shattered completely on the *outer* lamination *although it still held pressure*. As the pressure was allowed to fall, the port windscreen also shattered at 10½ lb/sq in, again on the outer lamination. As a result of the windscreen failure a new method of seating was designed. The modified windscreen has been successfully tested to 11 lb/sq in, and this method has been applied to the production aircraft.

The deflection measurements obtained were not in any way excessive, and there was no appreciable permanent set after the application of unit pressure (5½ lb/sq in) and only a very slight set of 0.018in at the astrodome position after application of fully-factored pressure (11 lb/sq in)

The strength test calculations can be summarized as proving that (a) the structure is satisfactory for strength at proof and ultimate pressures; and (b) much useful information regarding the diffusion of load in the region of openings in the fuselage shell has been provided by the extensive use of strain gauges.

It is worthy of note that at no point in the structure were stresses in excess of 11 tons/sq in recorded up to the maximum factored pressure differential of 11 lb/sq in.

FOLKESTONE TROPHY AGAIN?

THE race for the Folkestone Aero Trophy is, we understand, to be organized again during the week-end of August 31-September 1. The course is to be the same as it was in pre-war years, with three turning points and with the starting and finishing posts of the three-lap race at Lympne. At the moment, Lympne airfield is by way of being something of a derelict, but we hear that the Cinque Ports Club is being revived.

TUDOR POINTS

IN the course of a recent statement disputing the suggestion that no Avro Tudors will be in operation this year, Sir Roy Dobson explained that, of the Tudor 1s, the second and third aircraft off the production line were ready and that the fourth and fifth would be flying before the end of this month. The remainder, totalling 15, were expected out at weekly intervals. A number of Tudor IIs should, he said, be delivered in time to be put into operation before the end of the year.

Referring to the difficulties which have cropped up over the tail unit of the Tudor, Sir Roy said: "The facts are that it has been necessary to fit a larger fin and rudder in order to give easier and better control of the aircraft in the event of one of the outboard engines suddenly failing at the most critical moment—just as the aircraft is becoming airborne at take-off. This is due to the fact that the requirement was not in force when the Tudor I was originally designed. In its original condition the aircraft was quite safe in every way, but, in order to get the aircraft licensed for the shortest possible runways, it is necessary to make it controllable at the lowest possible speed. This has been done—hence some delay. The only other alteration which we considered necessary was to reduce the gearing of the rudder controls and fit assisters to relieve the load on the pilot's foot in extreme cases only."

AIR-MINDED MAYOR

BLACKPOOL'S Mayor and Mayoress, Councillor and Mrs. Frank I. Nickson, accompanied by small civic party, left Squires Gate Airport on May 2nd in an aircraft chartered from the Lancashire Aircraft Corporation, Ltd. They were paying a three-day visit to Copenhagen, in response to an invitation from the Burgomaster. Afterwards, the party was flying on from Copenhagen to Oslo and to Stockholm before returning to England. This is not the first charter air trip by Blackpool's Mayor and Mayoress, for, in March, they flew to the Isle of Man to attend a civic function.

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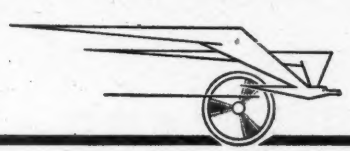
WINGS ARE THE WHEELS OF ***TO-DAY***



CABIN ATMOSPHERE RESEARCH

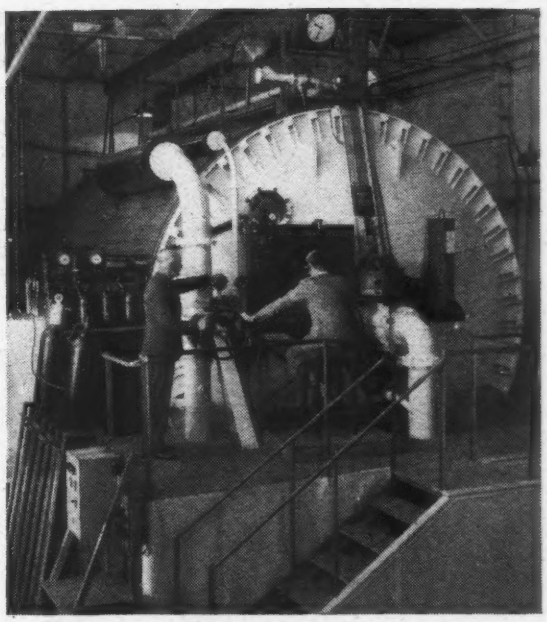
IN other pages of this issue will be found an article on the pressurizing of the Avro Tudor I airliner, and as the installation in this aircraft largely employs Westland pressurizing equipment and, in fact, that company have done a considerable amount of research on the subject, the accompanying illustration is doubly interesting.

A subsidiary company to Westland Aircraft, Ltd., called Normalair, Ltd., have, in addition to other extensive research equipment, this large decompression chamber in which they are now carrying out research into the subject of providing complete passenger comfort at all altitudes.

The chamber can accommodate a fuselage specimen 15ft long × 11ft diameter, and the air between the two can be exhausted to an equivalent altitude of over 70,000ft by means of an exhauster-compressor. At the same time suitable temperature conditions down to −70 deg F can be reproduced by a 125 h.p. refrigerator, the chamber being lagged to reduce heat losses to a minimum. An electric air drier is employed for reproducing any desired humidity conditions.

The photograph shows a test being carried out in which the altitude in the fuselage is maintained at the equivalent of 2,000ft, whilst the annular space surrounding the fuselage is exhausted to the equivalent of 15,000ft. Engineers inside the fuselage and outside the test chamber can see each other through the double porthole, and communication between them is by means of a loudspeaker and standard R.A.F. intercomm. equipment.

It may be recollected that reference was made to the extensive research equipment in the article on Westland pressurizing equipment published in the Jan. 31st, 1946, issue of *Flight*.



The Normalair Ltd., decompression chamber capable of taking fuselage specimens up to 15ft. × 11ft. diameter.

ONE OF THE VICTIMS

WITH the nationalization of airlines and of those airfields required in the system, quite a number of people will find that they have worked very hard for a number of years only to be dispossessed just as the civil aviation business is really showing good signs of being able to pay for itself.

One of the outstanding, if sometimes "difficult," figures in pre-war internal airline operation was Mr. Gandar Dower, who owned Dyce airfield at Aberdeen, and who operated Allied Airways (Gandar Dower), Ltd. Under the appropriate Roman arena cry of ". . . we who are about to die salute thee," Mr. Gandar Dower has recently issued an entertaining, if sad, history of his various ventures. This is in the form of a series of telegraphic statements and of items of conversation between himself and his secretary, Miss Caroline Brunning, from 1930, when he first went to Aberdeen, to 1946.

Starting in 1934, Aberdeen Airways "made" an annual loss of between six and eight thousand pounds on the internal services. In 1937 Mr. Gandar Dower ran a service across the North Sea to Stavanger, in Norway, and this, though carrying the Norwegian mail, caused him a loss of £16,000 in two years.

With the arrival of the airline licensing scheme in 1939, and the consequent granting of a seven-year operating freedom on certain routes, it seemed that, at last, Allied Airways were to be given a clear run. The war, of course, intervened, and the services were continued under Government orders. During this period the airlines, which were run as an "essential service," were guaranteed against loss, but the company was permitted only a maximum of 4 per cent profit.

And, presumably, Allied Airways will be taken over at the asset value and no compensation will be offered for fifteen years of effort at a not inconsiderable loss. During the years the annual passenger-totals have risen from 874 to 12,000 and the annual net receipts from £1,300 to £45,000.

Mr. and Mrs. Winston Churchill, who were so enthusiastically received in Holland last week, are seen here at Croydon Airport with their daughter, Miss Mary Churchill just before the party left by K.L.M. Dakota for Schiphol. Beside them are the Dutch Ambassador H. E. Jhr. Mr. E. F. M. J. Michiels van Verduynen and his wife, and also (extreme left) Capt. H. Spry Leverton, K.L.M.'s Regional Director for the U.K. who travelled with them.

BACK TO NORMAL

THERE will be at least two private flying events of interest during the Whitsun week-end.

The Luton Flying Club is organizing an air rally to which all other club members are invited. There will be the usual flying exhibitions, as well as arrival, height-judging and spot-landing competitions. The United Services Flying Club is to be officially opened on Whit-Sunday with the organization of a somewhat similar party at Elstree.

On June 1st the Reading branch of the R.Ae.S is holding a flying garden party at Woodley Airfield, with demonstrations of aircraft, of glider towing and of one of the latest military fighter types.

D

Proving Flight

Illustrated by "Flight" photographs

The Bristol Wayfarer passes over Corbier lighthouse on the coast of Jersey.

CHANNEL ISLANDS AIRWAYS are the first on the list of waiting customers for the Bristol Wayfarers and, because of this, it is not surprising that their main routes should be selected for a trial run of the new aircraft.

Piloted by A. J. Pegg, Bristol's Assistant Chief Test Pilot with Commander J. M. Keene Miller of C.I.A. in the second pilot's seat, the Wayfarer flew from Filton to Southampton and thence, after the passengers had passed through the customs, to Guernsey. After being inspected by the Lt.-Governor and Bailiff, it was flown over to Jersey and there displayed to Mr. Chuter Ede, the Home Secretary, who was in the islands to celebrate the first anniversary of their liberation from German occupation, and to the good Jersey Islanders at large. In the evening it was flown to Croydon, taking one hour fifteen minutes for the 180-mile journey against a strong headwind. This, it must be understood was a proving—not a delivery—flight. It is expected that the first delivery will be made at the end of May or early in June.

The outstanding impression one gets as the Wayfarer is boarded is of spaciousness and solidity. No other cabin has given such an appearance of roominess and strength since the days of the H.P.42 and Short Scylla. Even where the main spar crosses the cabin roof there is plenty of headroom for a tall man.

In width there is ample shoulder room for four people abreast, and the gangway is of such width that passengers do not automatically turn sideways to negotiate it.

Only a short stairway of three or four steps is needed to reach the door from the tarmac, and the tail-down floor angle is just right for comfortable progress to one's seat. There is no feeling of climbing, neither is there that climb of eight or nine feet up a ladder to reach the door of a

The Rumbold-appointed cabin, looking aft from the steward's pantry. Aesthetically the seat backs might be considered rather high, but they are very comfortable.

Prototype Bristol Wayfarer Makes a Practice Run to the Channel Islands on Liberation Day

The Home Secretary, Mr. Chuter Ede, descends from the forward freight compartment after inspecting the Wayfarer. On the top of the steps is Cdr. Waters, managing director of C.I.A.

IN GUERNSEY: Mr. K. Bartlett (of Bristols) talking to Lt. Gen. Sir Philip Neame, V.C., C.B., D.S.O. (Lt. Governor of Guernsey) and Mr. K. W. C. Grand (Chairman of C.I.A.). Flitting in the background is the energetic Robert Wieland (C.I.A. traffic manager).

tricycle undercarriage aircraft that passengers so dislike.

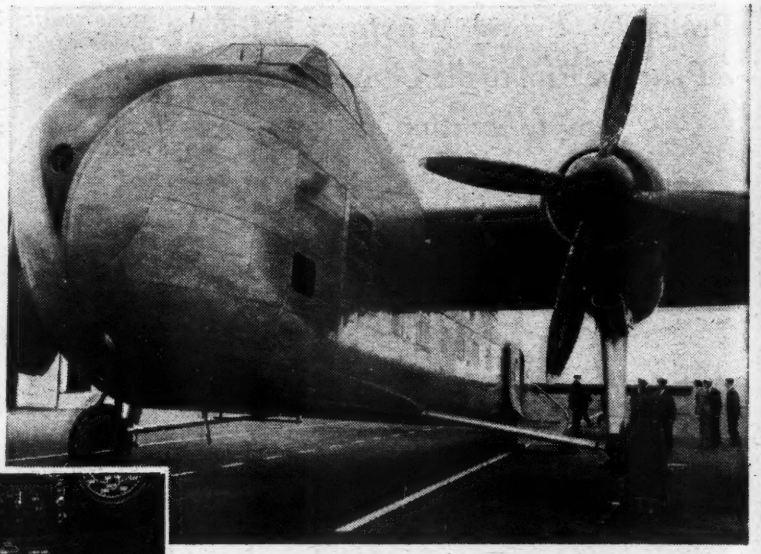
The double armchairs, which Mr. Rumbold has managed to get down to 50lb weight each, are very comfortable. For any flight lasting less than three hours the standard can be considered as luxurious. Each armchair has a square window of ample dimensions from which easy vision is obtained for 120 deg on the fore-and-aft line and 60 deg downward. One has to lean forward slightly to use the windows to their full advantage, and slight movement of the headrests forward in relation to the windows would be an improvement. Where view is concerned, no one could fail to appreciate the advantages of the high-wing arrangement. They are threefold: The glare from a metal wing is avoided; each seat has

The good Jersey Islanders crowd round to inspect the Wayfarer.

PROVING FLIGHT

an equally good view, and the shade of the wing is comforting and saves a good deal of eyestrain.

It would be expected that the impact of the slipstream from the airscrews would hammer badly on the slab-sided fuselage. This, however, does not appear to happen. By placing a hand on each fuselage frame in turn it was impossible to detect excessive vibration in any particular member. Two persons sitting side by side in one of the armchairs are able to carry on a conversation without raising their voices, and the talk going on around one can be heard without straining the ears.



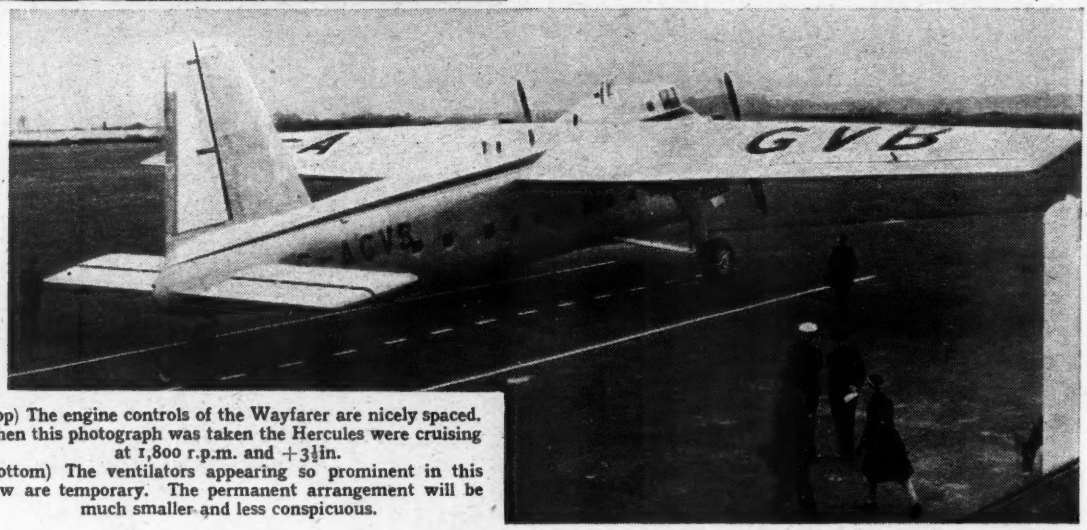
Wayfarer has a bold and very British look about it. It must, of course, be remembered that it is developed from an entirely freight-carrying type.

Nevertheless there is a pronounced drumming which is distinctly unpleasant. Having carefully tested the cabin for slipstream hammer and volume of noise, one can only presume that the trouble lies in the stub exhaust pipes which are fitted. If these were fed into a collector ring and taken by two long exhaust pipes over the wing, it is possible that a big improvement would result. The only other slight criticism which might be made is that when the individual ventilators are unscrewed to admit air, the control plates become loose and rattle in an irritating manner.

The luggage rack is quite exceptionally good. It appears to "hold" the baggage in a gentle grip, and there is none of the usual vibration dance which moves one's luggage two seats further down the cabin.

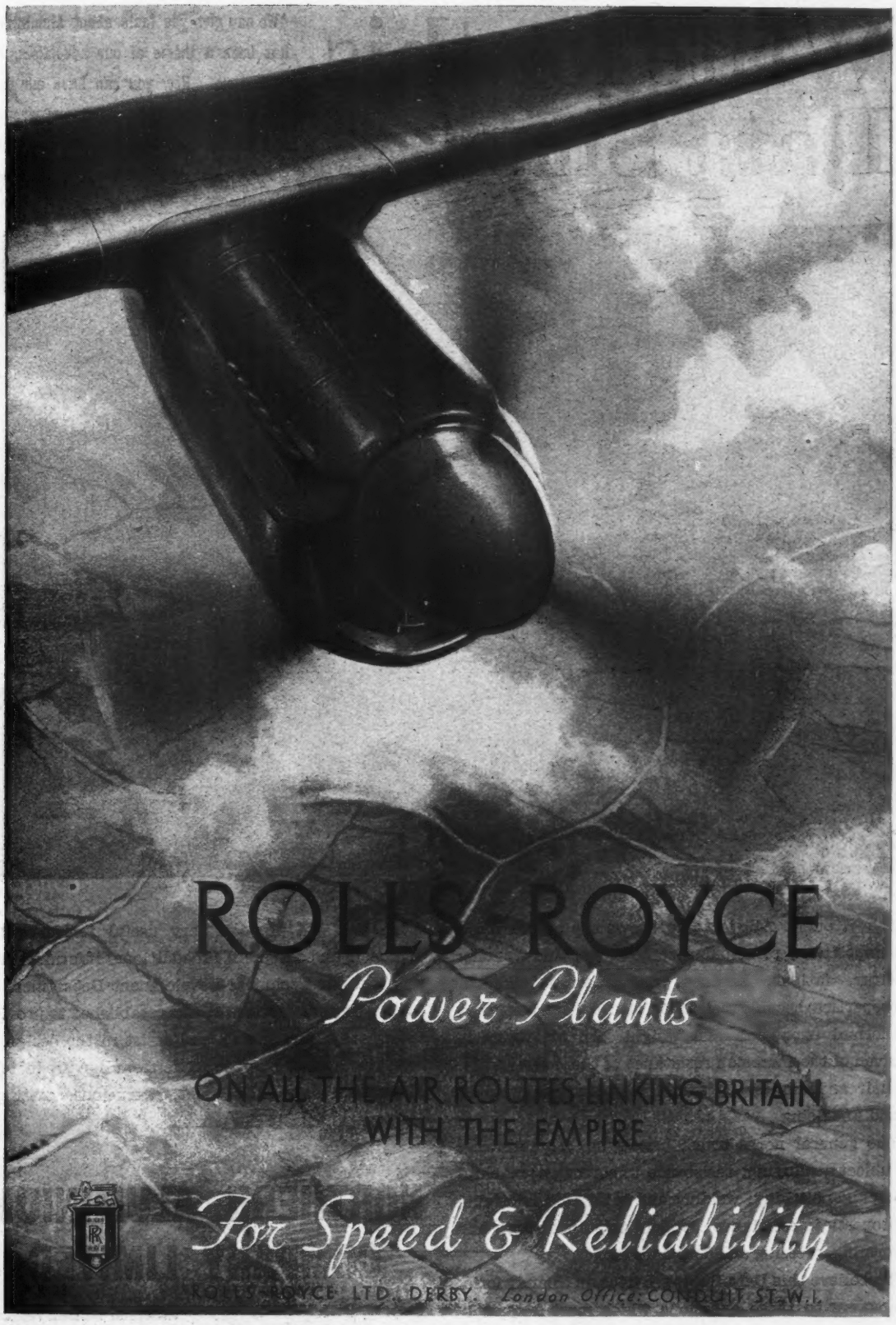
A final impression. By the shortness of run taken both for take-off and landing on this proving flight, it is obvious that the Wayfarer can operate from any airfield in the world worthy of the name.

J. Y.



(Top) The engine controls of the Wayfarer are nicely spaced. When this photograph was taken the Hercules were cruising at 1,800 r.p.m. and +3½in.

(Bottom) The ventilators appearing so prominent in this view are temporary. The permanent arrangement will be much smaller and less conspicuous.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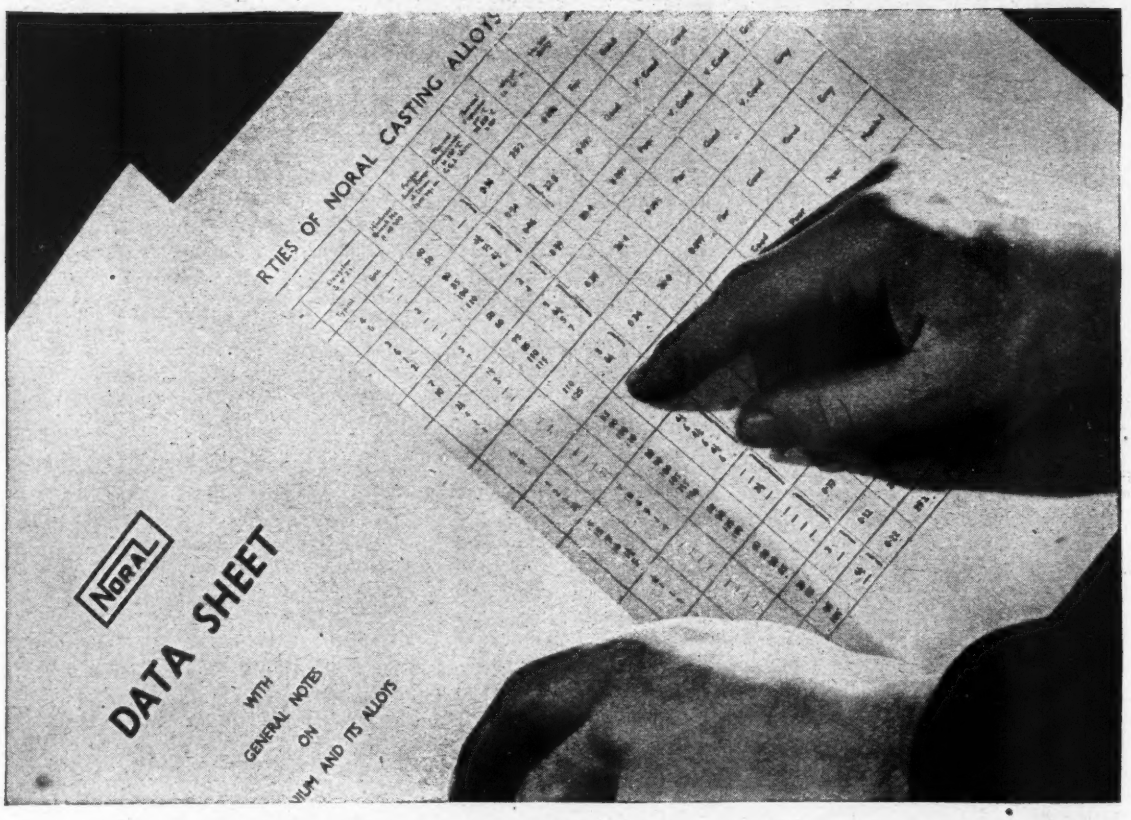
Write for this Data Sheet

'We can give you facts about Aluminium' has been a theme of our advertising for some time. Now you can have our Data Sheet — full of facts about our wrought and cast alloys; accompanied by useful general notes on aluminium and its alloys.



The Wrought Alloys table shows the approximate composition, principal specifications, and tensile, shear, fatigue, hardness and other mechanical properties; specific resistance, thermal conductivity, thermal expansion and weight. An indication is given of the corrosion resistance of these alloys, and their amenability to machining, forming, welding and anodising.

The general notes touch briefly on the following subjects: alloying, resistance to corrosion; machining and polishing; welding and soldering; frictional properties; resistance to denting; anodising; and forming, pressing and deep drawing.

We believe this Data Sheet provides, in a handy form, answers to those questions which most frequently arise, and will prove a very useful reference for engineers and designers. If additional information is required our Technical Development Department is always at your service. It was established to provide information and advice, and assist in the design of anything which may be made from our products—aluminium and alloy sheet, extrusions, castings, forgings, and paste (for paint).

NORTHERN ALUMINIUM COMPANY LIMITED

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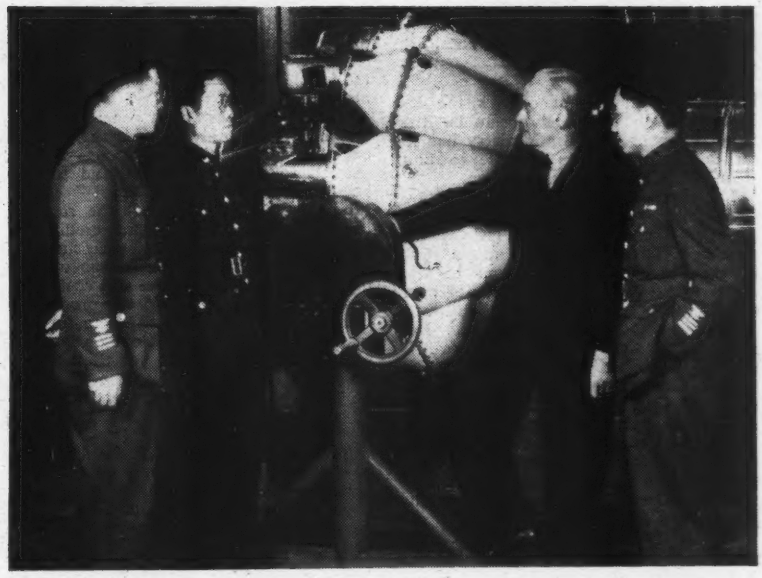
HERE AND THERE



ORIENTAL INTEREST: Under a licence agreement recently arranged between Rolls-Royce and the Chinese Government, gas turbine and jet engines are to be built in China with the approval of the British Government. Chinese engineers are now being trained at the Derby works, and Rolls-Royce engineers are to go to China to supervise the tooling-up of factories there. The firm's chief engineer, Mr. A. G. Elliott, shows the Nene engine to officers of a Chinese mission now in Great Britain.

Last of the Yanks

BY June 1st all members of the U.S. Strategic Air Forces in Europe will have been re-deployed out of England, according to a letter which Col. T. W. Scott, commanding the U.S. Headquarters Base Air Depot, is reported to have sent to the Mayor of Leicester last week.

The colonel qualifies the statement with the words "providing present plans materialize," but subject to that, he says that their European Air Services Command will be "completely dissolved" by that date.

A.T.C. Officers' Courses

VARIOUS courses laid on for the benefit of A.T.C. officers are available at a number of R.A.F. stations, the chief one being the administration course which began on the first of this month at Locking, near Weston-super-Mare, where there are vacancies for 30 officers each week.

The administration course is obligatory on each A.T.C. officer early in his career, and the syllabus emphasizes the technique of instruction. Incidentally, the Locking station has a reputation for providing excellent quarters and good food for its A.T.C. visitors.

Some courses are dependent on the number of officers desiring to attend, as, for example, the equipment officers' course at Stannington, while any A.T.C. officer wishing to obtain information on any subject connected with his own particular Corps duties can usually arrange to be attached for a short period to an appropriate R.A.F. station for this purpose.

The German Scientists . . . .

A HEADLINE in one of our more hysterical daily newspapers last week sought to convey the impression (and doubtless succeeded in large measure) that the bringing of a number of German aeronautical scientists and engineers to this country to help in gas-turbine and aerodynamic research was due to the recent resignations from the Government-owned Power Jets organization.

This, of course, is not the case. The arrangement is the direct result of an agreement between Britain, Russia and the U.S., arising out of the disarmament of Germany, to share between the three countries the services of some of the pre-eminent German experts of international renown. Other German experts are, therefore, similarly going to Russia and America.

. . . . and Their Work

WHILE we are getting along quite well towards the solution of a number of problems—notably compressibility problems affecting performance near the speed of sound—the Germans' help will be welcome in getting the complete answers more quickly; the time factor is obviously important in keeping Britain in the lead in these things.

They cannot tell us very much, perhaps, but as Germany spent millions on special equipment their experience may save us money in building the simplest and best test plant—super-sonic wind tunnels, etc.

Such men, therefore, as Professor Buseman (international expert in the theory of aerodynamics), Professor Ernst Schmidt (specialist in axial compressors), Dr. W. Encke (who was engaged on Me 262 development) and Dr. Hilpert (physicist specializing on heat transference and refrigeration) can patently be of considerable service to us.

Another Fairey Firefly

FLIGHT mentioned recently, in its "Industry" section, that the name Fairey would soon be associated with a new product which, though intimately concerned with the water, had nothing to do with the Naval Air Arm.

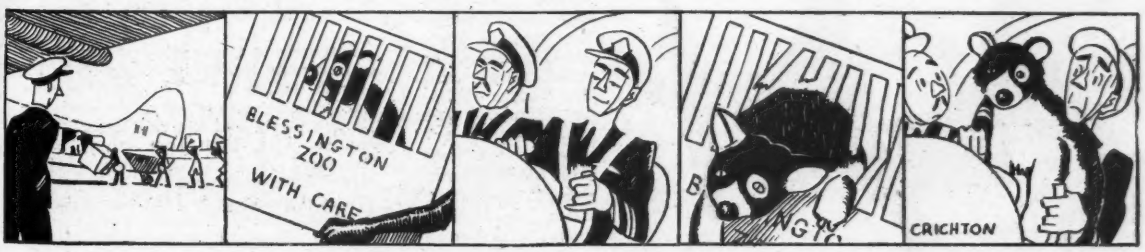
The June issue of our associate journal, *Yachting World*, publishes the first full description and photographs of one of the new products, namely, the new Y.R.A. 12ft National Firefly class dinghy produced by Fairey Marine, Ltd. (a subsidiary of Fairey Aviation), at Hamble, and designed by Uffa Fox, leading light in the racing dinghy world, who is now consultant to the company.

A 15ft National class craft, also sponsored by the Y.R.A., is soon to follow, and both types, constructed in moulded ply, are to be produced in quantities when materials become available.

Homeless

DISCONTENT is seething among the cadets and officers of the Dagenham Squadron of the A.T.C., which is in

AIRSTRIP . . . . No. 14



HERE AND THERE

imminent peril of not only losing its headquarters, but of having to be disbanded because the Air Ministry has so far failed to keep its promise to find them alternative accommodation.

This squadron, proudly described by the local Mayor, Alderman F. Thomas, as "one of the strongest A.T.C. squadrons in London," played a major part in that excellent film, "Sons of the Air," which was produced by its own commanding officer, Flt. Lt. Edward Jarratt, and the present trouble has arisen because the school building which has been its headquarters during the war is now wanted back by the local education authorities, who, naturally, have a prior claim to it.

Strenuous efforts are, of course, being made to obtain a new home and keep the squadron's flag flying—if it is not too late when these words appear in print, good luck to them!

Legion Tends R.A.A.F. Graves

MORE than 100 men of the R.A.A.F. who lost their lives in the Battle of Britain and the assaults on Germany lie in Stonefall Cemetery, Harrogate (Yorks), and their graves are being tended by the Harrogate Victory Branch of the British Legion.

Mr. E. Russell-Jones, chairman of the branch, has written to the next of kin of each man stating that a member of the Legion is prepared to take into his care one of the graves. The member will place flowers on the grave on Christmas Day and any other anniversary chosen by the relatives.

Viscount Lascelles is patron of the branch.

"It Makes Yer Think!"

WE mentioned, a week or so ago, the formation of a special R.A.F. unit in Germany whose function it is to produce a number of plays and revues for the British Air Forces of Occupation. This unit now has four shows on tour and two more in rehearsal, and nobody will deny that the men (and women) who have the unenviable job of occupying Germany deserve every consideration in the matter of such things as entertainment.

But, with its customary generosity, the Board of Trade only granted this unit a beggarly 500 clothing coupons—barely enough to dress one show—and it has been left to the unit's "Waaf" wardrobe mistress to "fiddle" the rest as best she could. To her great credit she seems to have been quite successful.

Having read a day or so ago of the many thousands of dresses and costumes which were *not* denied to the producers of a much-criticized British film, one is moved to echo Douglas Young's famous observation, "It makes yer think!"

Air Pageant

THE Southampton branch of the Air League of the British Empire is to hold an air pageant and exhibition in aid of Service charities with the support of the R.A.F., the Naval Air Arm, the S.B.A.C., and the local authorities of Southampton, Winchester, Romsey and Eastleigh.

The pageant will be staged at Southampton Airport on Saturday, June 22nd, and the exhibition is to be held in St. Mary's Hall during the preceding week; it will be formally opened on the afternoon of Saturday, June 15th, and close on Friday, June 21st. Air Marshal Sir Philip Joubert is to perform the opening ceremony.

News in Brief

MARSHAL of the R.A.F. Lord Tedder last week attended a passing-out ceremony of the R.A.F. Regiment at Belton, near Grantham, and presented a medallion to the "prize cadet," Officer Cadet A. W. Clifford.

* * *

The New Zealand Deputy Chief of Air Staff, Air Comdre. M. W. Buckley, was reported, as we go to press, to be due to leave for Britain to take up his post as A.O.C. the R.N.Z.A.F. in this country.

* * *

A B-29 was reported from Manila to have broken the world's altitude record for landplanes in the 10,000 kg class on May 7th by reaching 39,360ft over Guam. The previous highest in this category was 23,759ft.

* * *

Two R.A.A.F. officers, Flt. Lts. F. J. Blakeney and R. A. Scutt, are to attend London University as winners of research travelling grants of £475 a year under the Gowrie Scholarship Fund established by public subscription in January, 1945, for members of the Australian Forces and their descendants, to commemorate the services of Lord Gowrie, Governor-General of the Commonwealth from 1936 to 1944.

Two medals of the Professional Institute of the Civil Service of Canada have been awarded for work in radio and radar during the war; one to the technical staff of the radio branch of the National Research Council, and the other to Mr. W. A. Rush, Controller of Radio, Department of Transport.

* * *

R.A.F. personnel and a detachment of the Royal Marines are to go with the 5,450-ton British cruiser, *Bellona*, and her escort of destroyers, to attend the sixth anniversary celebrations of the recapture of Narvik on May 28th. The French Air Force will also be represented.

* * *

The London Gazette recently announced the reversion to the retired list, at his own request, of Acting Air Vice-Marshal Sir Leslie Gossage who in February resigned as Chief Commandant and Director-General of the A.T.C. Sir Leslie was previously chief of Balloon Command and had been Air Attache in Berlin in 1930-31.

* * *

Four Derby charities divided the net profit of £673 18s 4d from the week's run at the local Grand Theatre of the Alan Turner Opera Company's production of the Strauss operetta, "1,001 Nights." This was the largest amount raised on any single production, and brings the total sum raised for charity by this company to over £2,300.

* * *

Air Vice-Marshal Sir Hugh Champion de Crespigny, one of the four regional commissioners recently appointed to the British Zone in Germany (his region will be Schleswig Holstein) retired from the R.A.F. in 1945 to contest the Newark division of Nottingham in the General Election. He began his Service career as a private in the Australian Army in 1914 and later became a night-fighter pilot. He holds the M.C., D.F.C. and Croix de Guerre.

* * *

Aircraft noses, shields, and turrets are to be among the Perspex exhibits in the plastics section of the Chemical Research Exhibition to be opened at the corner of Jermyn Street and Lower Regent Street, London, W.1, from June 5th to 28th. Organized by I.C.I., the object of the exhibition is to show the achievements of British chemists during the war and their peacetime uses. Proceeds from the admission charge of 1s go to the Empire Fund for Cancer Research.

JET MAIL PROJECT

Miles Aircraft have submitted to the Postmaster General a design, based on the Libellula, the somewhat unorthodox canard or tandem-wing type which has been flying successfully for the last three years. This project, the M.63B, is intended for high-speed long-range mail-carrying, and can be powered either by two Rolls-Royce Derwent Vs or by three Power Jet W.2/700s. The maximum cruising speed will be 500 m.p.h. for a range of 2,000 miles, and the consumption is estimated at 195 gal/hr for an economical speed of 385 m.p.h. at 36,000ft. The payload will be 4,000lb. The three-jet version is shown here in model form, with Mr. George Miles, the designer. The tandem-wing arrangement, at least in the Libellula form, should be well suited to jet unit installation and thrust efficiency.

Painting by Anna Zinkeisen

This Present Age . . . I

As the largest steel producers in the British Commonwealth of Nations, we comprise not only a highly complex industrial structure, but also a vast community of human interests. In Cumberland, Yorkshire, Lincolnshire and Northamptonshire, the organisation operates collieries, iron ore mines, limestone quarries, blast furnaces, iron foundries, steel works, forges, rolling mills and other ancillary plant essential to its business. All these instruments of production are owned by a great number of small investors representing every section of the people. Thus, without exception, each employee is virtually a trustee of these properties with all the implied responsibilities of such stewardship. It is a source of pride that employment is provided for about 35,000 citizens of our Nation, each of whom, with his dependents, has a vital stake in the prosperity of our undertakings. The whole enterprise is an intricate relationship of human personalities and qualities. It is an integration of the varied combinations of administrative faculties, technical attributes and manual skill. Nature does not bestow the same talents on each of us, but within the organisation there is ample scope for the development of initiative and aptitude. Without distinction, every encouragement and help is given to those who possess the intrinsic endowments of character, diligence and intelligence. Social progress depends upon a just appreciation of widely differing human characteristics freely co-operating to achieve a common purpose.

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IN THE AIR—XV

Hudson and Ventura

Complicated Simplification in a Militarized Transport : The "Super-wheeler" is Invented : Applied Science

By " INDICATOR "

NEVER, in my ungainly flying history, was ignorance so blissful as on the morning of a day early in 1940 when I left Speke airfield alone in my first Hudson. Nowadays, when I think of it, my toes turn up. Yet, beyond the fact that I could not succeed in making myself feel part and parcel of this roomy and somewhat complicated airship, I can remember no more than a normal nervous disturbance during the minute or two during and after the take-off there, or during the landing, three-quarters of an hour later, at Aston Down.

Yet this ignorance must have been only partial, since most of us then knew that the Hudson, worthy though it turned out to be as a maid-of-all-work, did not suffer fools gladly. In pre-war days this aircraft, in its Lockheed 14 transport form, had caused the training experts of British Airways a good deal of thought, and I believe that even their most experienced pilots were expected to put in not less than fifteen hours dual before flying it for hire or reward.

The entire technique of Hudson flying was, to the pilot trained on British types, something new and slightly peculiar, but it seemed, nevertheless, to submit fairly gracefully to any sensible handling procedure. At Silloth it was possible to watch a special technique being practiced in a very extreme form. There, at the Coastal Command O.T.U., Hudsons could be seen screaming in at something over 100 knots, to be put down firmly on the wheels and held thereon with the control column against the dashboard. The fact that the Hudson's c.g. was so far aft meant that, while making the type somewhat directionally tricky in the three-point landing position, it would take almost anything

Some seven feet greater in length than the Hudson, the Ventura handled rather more nicely in landing conditions. In this flying picture, taken from another Ventura, the salient external differences between this type and the Hudson can be seen—including the lower dorsal gun position.

in the way of heavily braked and exaggerated "wheeler." So, regardless of the fact that very much shorter landings could be made by more British methods, the "wheeler" became the accepted Hudson technique.

To the pilot who had never before handled the type, and who had not been given any particularly valuable advice, a "wheeler" certainly proved to be the most natural form of arrival. Perhaps some instinct warned the newcomer, from the very feel of the thing, that it would be a bad practice to trim the aircraft right back for the landing, and only if such trim was applied was it decently practicable to make a conventional three-pointer. Somehow or other, at any other trim setting, the Hudson tended to drop on its wheels and to stay on them quite happily until almost stationary.

I am not quite sure, whether, on that first trip, the Hudson's flap "stop" had been fitted, but possibly I had been warned not to use an angle of more than sixty or seventy degrees. With a setting beyond that point the most unpleasant things could happen if the throttles had to be opened again after a baulked or otherwise misjudged arrival. Apparently, at any greater angle, the slipstream bounced off the flaps and provided an uncontrollable fore and after trim reaction.

A characteristic view of the Hudson as it comes in to land, with the Fowler flaps half extended and laying bare the wing structure. The "humpiness" of its appearance provides, to a student of form, a guide to some of its qualities.

Overshoot Drill

Even at a more moderate flap setting the work of "going round again" could be quite hard—particularly as the fore and aft trimming control worked in an unlikely axis. This control consisted, in fact, of a small handle which, like the directional trimmer, "screwed into" the control pedestal. The best means I found of remembering the correct movement was to imagine oneself "screwing" the aircraft's nose up or down; so, if the handle was turned in a clockwise direction the aircraft became tail-heavy, and, if turned in an anti-clockwise direction, it became nose-heavy.

But, in spite of all one's memories of points which were, to British eyes, mere peculiarities, these, to the fully experienced driver of Hudsons, became of little or no importance. In any case, this militarized transport could fairly be described, while it was airborne, as one of the most interesting and docile of aircraft. Typically American in cockpit layout, the Hudson gave its crew the feeling that, while flying it, they were engaged in an exciting battle with science. It was possible to set everything, from the boost onwards, with the most complete accuracy, and there were instruments and devices enough to fill the needs of the most experimentally minded pilot.

In the earlier versions at least, the mixture control was entirely manual, and one could play continuously with it while watching the readings of the somewhat temperamental exhaust-gas analyser dials. When tired of this occupation, one could make abstruse calculations covering previous prospective fuel consumption and make use of the pleasing variety of the tank arrangements. As far as I can remember, one was abjured to take-off and land on the right-hand rear tank. Once upon a time a friend of mine not only took off on that tank but continued to fly on it; both motors cut out together over Blackpool sands.

He forthwith changed tanks and, miraculously enough, both of them came in again together more or less as he was holding off in preparation for a bit of an accident. The Goodrich de-icer was another item which gave opportunities to the otherwise bored conductor, and, if the worst came to the worst, some signally varying oil temperature indications could be obtained by the misuse of the two cooler controls. And all the various devices were laid out with the complicated American simplicity to which we were not then accustomed. A Hudson was certainly a two-man ship.

In the opposition to the then-standard British idea of an automatic pilot, which involved one in serious pre-flight consideration if it was to be used, the Sperry in the Hudson or Ventura could be operated quite satisfactorily at a moment's notice. Provided, of course, that one had *not* left the flap lever in the "up" position, thus depriving the automatics of the necessary hydraulic urge. The only fault of the system, as applied to the type, was that the main "on-off" control was placed next door to, and was identical with, that used for locking and unlocking the tail wheel—one of the results sometimes obtained when a passion for scientific planning overrules all other considerations. Fortunately, the two levers worked in opposite directions and there was, if I remember correctly, a form of stop on that for the automatic pilot.

As in the case of the majority of American aircraft, this tail-wheel lock was meant to be used, and it made all the difference in the world to initial part of the take-off run and to the later part of the landing run. But it would be interesting to know how many times pilots have tried to turn at the end of their run with the lock still "in" and wondered why the differential braking system was so unsatisfactory.

Some of the later Hudsons and Venturas had conven-

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WESTERN AVENUE. ACTON. LONDON. W.3.

HUDSON AND VENTURA (CONTINUED)

tional American toe-operated brakes, but in the earlier versions a Ford car-type hand brake, with simple ratchet gear, was moved in and out of the central control pedestal. Taxying in a cross-wind could be quite a sleight of hand feat—done best, perhaps, with the left hand on the throttles and the right hand on the lever. In theory, at least, differential rudder action could be obtained by applying the brake to the extent of a couple of notches, but, in fact, one seemed to find that the brakes were either on or off and it was necessary, for results, to "saw" away at the lever most of the time.

I hate to think of the risks which were taken in the earlier ferrying days when Hudsons were delivered by a crew of one—the pilot—and with the undercarriage recklessly retracted. Although hydraulic failure could hardly be expected, any necessary emergency operations would have been difficult if not impossible without the help of an assistant to operate the emergency hand pump. I cannot remember the exact details of the "drill" in the case of such failure, but I know that one lowered the flaps and flew at 80-90 knots. At the critical moment one would suddenly close the throttles, while holding the control column well forward, so that the deceleration would cause the undercarriage legs to swing towards the "down" position; at that critical moment, neither before nor after, the emergency pump was vigorously pumped to lock the legs home. Apparently, if this action was not carried through with proper accuracy, the legs were liable to jam themselves in an intermediate position.

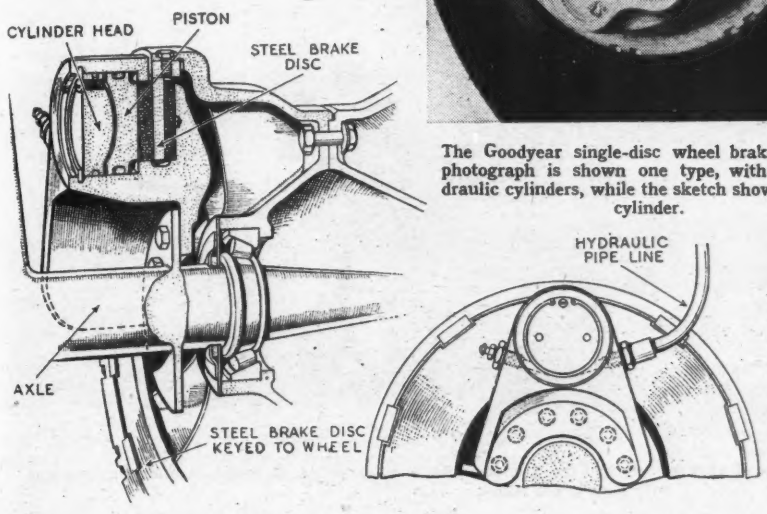
By way of ending at the beginning, I wonder how many Hudson or Ventura pilots could guarantee to start the engines single-handed. It *could* be done, but the movements had to be planned as carefully as those of any Bidaux-organized factory operation. There were two buttons, one for the starter and one for the booster, with a tumbler switch to select the required engine. While depressing these, the doper had to be used, the wobble-pump below the throttles worked, and the cut-out released as soon as the engine fired. Then there was the job of keeping the cold motor going while still depressing the booster button. Quite an affair.

I tested my last Ventura three years ago, and memory is an unreliable guide—so I shall duly expect castigation from the real Hudson-Ventura experts. But, at least, my impressions may be entertaining.

A New Single-Plate Brake

THE GOODYEAR TYRE AND RUBBER CO. (GREAT BRITAIN), LTD., has just introduced a new single-disc wheel brake for aircraft. The brake comprises a single cast housing, slotted to receive a steel disc which is keyed to and rotates with the wheel. The housing contains brake lining segments, which bear against both sides of the disc when the brake is operated. The outboard portion of the housing contains the actuating mechanism of the brake (one or more cylinders in the case of hydraulic operation). Most wheels for this brake are of the split type incorporating inboard and outboard halves bolted together. The flange of the inboard half is extended slightly, and hardened steel drive-keys are installed to accommodate the slots of the rotating steel disc.

The Goodyear single-disc wheel brake. In the photograph is shown one type, with three hydraulic cylinders, while the sketch shows a single cylinder.

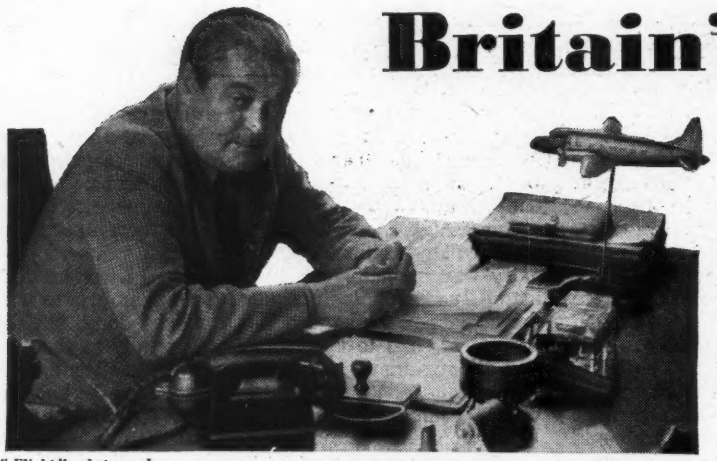


When the brake is applied, the outboard lining is moved against the face of the rotating disc. As the disc is free to align itself in the wheel, it moves inboard sufficiently to make contact with the inboard lining. As the brake pressure increases, the rotating disc is clamped more tightly between the linings, and its rotation is arrested by such clamping action in proportion to the hydraulic pressure applied. Braking torque is transmitted to the wheel through the disc-drive keys in the wheel drive flange.

Rapid heat dissipation is achieved by the rotating steel brake disc being mounted in the inboard side of the wheel in a vertical position and flush with the edge of the wheel drive flange. Since only a small portion of the disc is blanketed by the brake linings and brake unit, most of the disc is exposed to the flow of air past the wheel. But little heat is conducted into the wheel, and thus the likelihood of tyre and tube failure from brake heat is reduced.

One of the advantages of the single-disc brake is that it combines a great capacity for energy absorption with low weight for a given wheel size. Ease of maintenance is another. No lining clearance adjustments are required, since these are achieved automatically. Replacement of linings is very quick.

Britain's Test Pilots



"Flight" photograph

No. 9
CAPT. JOSEPH SUMMERS, O.B.E.,

CHIEF TEST PILOT OF THE AIRCRAFT SECTION OF VICKERS-ARMSTRONGS LTD.

FOR the number of years he has been flying, Summers (who rejoices in the affectionate but quite unjustified soubriquet of "Mutt") has spent an exceptional percentage as a test pilot. As a young man of 21 he was granted a short-service commission in the R.A.F. and learnt to fly on Avro 504s and Sopwith Snipes at No. 2 F.T.S., which was then stationed at Duxford. His training was interrupted by six months' hospital treatment for throat trouble, but he eventually passed out at Digby in 1924 and was posted to No. 29 Fighter Squadron, which was then being reformed after being disbanded at the close of the 1914-18 war.

No. 29 had Snipes and later Gloster Grebes. This was the squadron which carried as its distinguishing marking the XXX on its fuselages and wings to denote its potency.

"Mutt" must have been, even in those days, quite an exceptional pilot because, after only six months with a squadron, he was posted to Martlesham Heath as a test pilot. He was one of only two short-service officers to have this distinction. At Martlesham he served in the single-seater flight under Flt. Lt. Sorley (now Air Marshal Sir Ralph Sorley, K.C.B., O.B.E., D.S.C., D.F.C., Air Officer Commanding-in-Chief, Technical Training Command, and Member of the Air Council) and helped to put the Gamecock, Bulldog, Hornbill and Avenger through their paces.

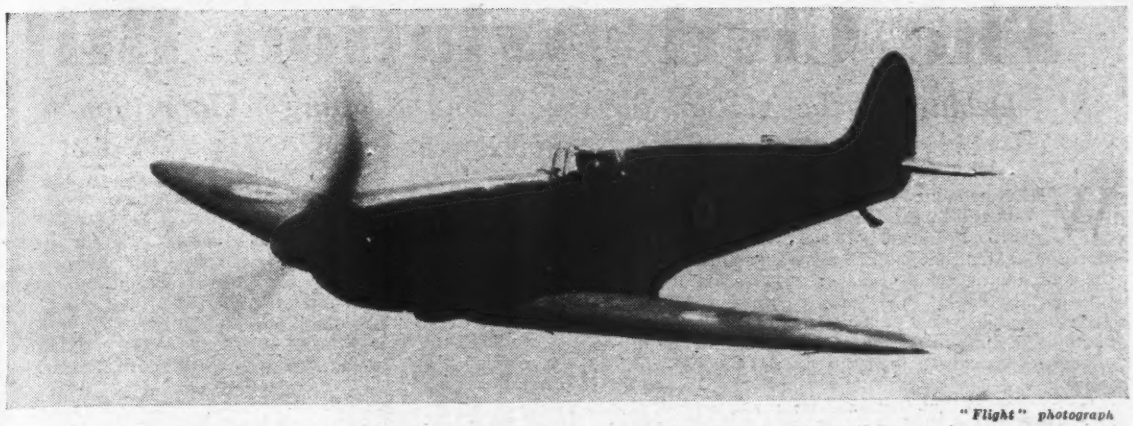
In spinning tests the Bulldog nearly forced him to make his first parachute jump. After vain attempts to stop the spin, Summers decided to jump and got hold of the handholds, which were provided in the wing centre-section, to pull himself up out of the cockpit. His body in the slipstream acted as a control surface. It altered the airflow over the tail and affected the trim of the aircraft in such a manner as to make it cease autorotation immediately. Flying once more on an even keel the jump became unnecessary, but no more spins were done on that flight. An extra 18 inches of fuselage were found sufficient to cure the trouble.

Another unusual experience which he had at Martlesham occurred while he was flying the Hawker Hawfinch. In those days military aircraft were put into a more or less vertical dive until they reached their terminal velocity. It was a rather brutal manner of testing the controls at maximum speed, and also the strength of the aircraft. To-day this test is unnecessary because the speed limit imposed by the Mach number can be attained in level flight. While the Hawfinch was at its T.V., the top decking of the fuselage collapsed and over-tightened the Sutton harness, which came through a slot at the back of the pilot's seat. Until he managed to get out of the dive, Summers was jammed hard against the seat back, and scarcely able to move. After this incident he never used shoulder straps again—he only uses those over the thighs—and this saved his life on a later occasion.

While still at Martlesham he was loaned to Blackburns and Avros to test and demonstrate their aircraft abroad. For Blackburns he tested the float seaplanes produced in their Greek factory, and for Avros he demonstrated the Avenger in the Balkans.

In 1929, "Tiny" Schofield, then chief test pilot of

The 235 h.p. Lynx engined Vickers Vireo of 1928/29. It had many modern features, being an all-metal, cantilever monoplane with guns in the wings.

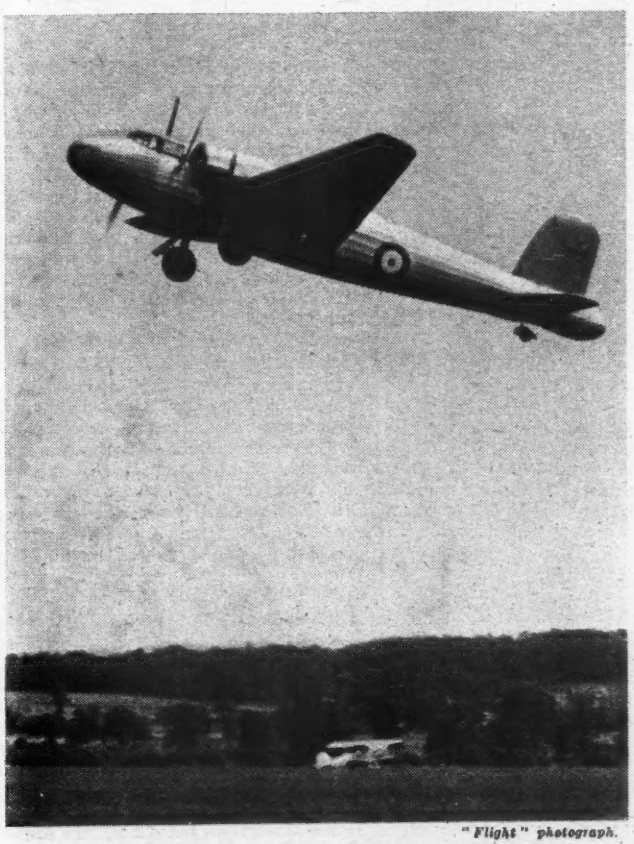


"Flight" photograph.

An early flight of the prototype Spitfire. It was a beautiful aircraft with its sleek lines, pale blue paint and high polish.

Vickers, was unfortunately killed whilst flying the Vanguard, and Capt. Summers left the service to take his place. His first prototype was the Vireo—a tiny all-metal fighter built on Wibault principles. It was designed for operation from the submarine M.2, which had a small hangar built to replace the 12-inch gun originally fitted.

Soon after he joined the company, Vickers acquired the controlling interest in Supermarines, so Summers then had to fly all their types, including flying boats such as the Scapa and Mark X, in addition to the Vickers products. This went on until the testing was taken over by George Pickering, who was killed later in a road accident.



"Flight" photograph.

The B9/32 prototype of the Vickers Wellington flying at Eastleigh airfield in 1936. The streamlined circular turrets were later changed to power-operated types.

The Wellesley, the first aircraft to be built entirely on geodetic principles (the G4/31 had a geodetic fuselage) was flown by Summers for the first time in July, 1935. This was the first cantilever monoplane to go into squadron service, and Summers had to go to Helwan airfield, near Cairo, to instruct the squadron in its use and maintenance.

"Mutt" Summers' closest shave, however, came when he was doing a T.V. dive in the prototype M1/30 torpedo plane over Brooklands. With a sudden bang and rending the tail twisted right off and the remainder of the aircraft bunted and then broke up in the air. Not being completely strapped-in after the Hawfinch incident, Summers was thrown clear. He never remembers pulling the rip cord of his parachute, and his next consciousness of things understandable was being picked up with a broken ankle and a head wound. The Good Samaritan was George Bulman, and the scene the top of the Members' Hill at Brooklands.

1936 was a vintage year for Summers, because in March of that year he test-flew the original Spitfire and, in June, the B9/32, which was later to become the famous "Wimpey." Both of the prototypes showed their quality in handling, and in the Spitfire the rudder was the only control surface which had to be altered to any great extent. It is peculiar how things impress themselves on the mind—disregarding all the other risks involved, he remembers that both of these prototype flights involved cross-wind take-offs and landings.

Flying Enemy "Opposites"

Shortly before the war Capt. Summers was on holiday in Germany with Jimmy Doolittle (then of Shell Union and now a General) and was invited by General Ernst Udet to fly the Me 109 and the Dornier 17. He was thus in the unique position of having flown the exact opposite numbers to his own aircraft. During the war there has been a re-arrangement in Vickers' test flying. Jeffrey Quill has now taken on all single-seater types, but of all types now in production, including the Warwick, Windsor and Viking, Summers has made the first flights. It was while flying a Warwick that he had his most recent "incident." The Warwick's rudder jammed hard over at 4,000ft, and, from the resulting flat spin, first the aircraft hit the trees below and then bounced off into a nearby ploughed field. As he and his mechanic, who had a broken arm, got out, both engines caught fire.

Capt. Summers has flown 4,500 hours in 310 different types of aircraft; he was awarded the O.B.E. in the 1946 New Year Honours. J. Y.

The Civil Aviation Bill

Debate on the Motion for the Second Reading : Opposition Amendment Defeated

WHEN he moved the second reading of the Civil Aviation Bill in the House of Commons on May 6, the Lord President of the Council, Mr. Herbert Morrison, stated that the Bill was a substantial step towards the complete nationalization, or *socialization* of British air transportation. He said that, before the war, Imperial Airways had been far from perfect. There had been some planning of Empire air routes, but this, and the intensity of services, had been inadequate. So, too, were the subsidies.

He considered that there had been no adequate planning of airports before the war. How far they existed, and where, had been largely a matter of sheer accident, and, apart from a limited number of airfields provided by private enterprise, the Air Ministry, at that time, had relied for them upon local authorities. This, said Mr. Morrison, was utterly wrong. Municipalities should not spend ratepayers' money on what was essentially a national service.

He said that he could find nobody who believed in free competition in civil aviation, with the possible exception of Lord Beaverbrook. He suggested that if anybody was allowed to run air services, there would be an economically impossible situation in the air, plenty of accidents, and all sorts of complications and troubles. Even in America, Mr. Morrison continued, there was no completely free competitive enterprise and there was a great deal of control by the Aeronautics Board. However civil aviation might be run, the State had to have in mind the needs, actual and potential, of the Royal Air Force and the relativities between aircraft production for civil and Service needs. Thus, the State had to be in the business to a very considerable extent. Mr. Morrison said that he was told that there were nineteen countries which possessed nationalized scheduled air services, and twenty-three countries where such services were partially nationalized.

Subsidies

On the question of subsidies he said that it was far easier for the Exchequer to subsidise a public concern than a private one. The Government was not enthusiastic about subsidies, and they were not being given for fun. As time went on, the subsidies should be tapered off.

Public ownership would mean that we could have sweep and boldness in our civil aviation policy, instead of vacillation, inadequacies, and the "creaming" of traffic. It also meant that Parliament could have a more effective say in the general policy, although Mr. Morrison emphasized that the Boards, once appointed, had a wide freedom of management and of business autonomy.

Three corporations were created so as to introduce and develop in the industry the spirit of emulation, of gathering a varied experience, and a certain degree of competition between varying undertakings.

The interest of the staff would be looked after. There would be joint consultative machinery for dealing with terms and conditions of employment, and it was the Government's wish that there should be free discussion between the management, the Board, and the staff on matters of mutual interest.

The time had come, Mr. Morrison continued, for the State to take over responsibility for practically all the public airports and airfields and to organize their finances. By this means there could be a planned network of airfields, and better and brighter British airports. A number of our airports had been shockingly dull. Under public supervision this could be remedied, and it would be easier under such a system to fit in navigational services.

Civil aviation could not be organized on too restricted a basis owing to its international character. It was therefore unwise to establish a separate autonomous corporation for Scotland. Nevertheless, there was to be a Scottish Division of British European Airways, and a Scottish Advisory Committee which would have not only access to the Board of the corporation and to the Minister, but also an advisory function in relation to B.O.A.C. Its headquarters would be in Scotland and both B.E.A. and B.O.A.C. would have offices there. Scotland would also have a regional board for the management of Scottish airfields.

Opposition Points

Mr. Lennox-Boyd opened the debate for the opposition and pointed out that Mr. Morrison's speech had thrown singularly little light on the provisions of the Bill. The opposition agreed with the distinguished pilot who said recently that ice and the politician were, to-day, the greatest menaces to civil aviation.

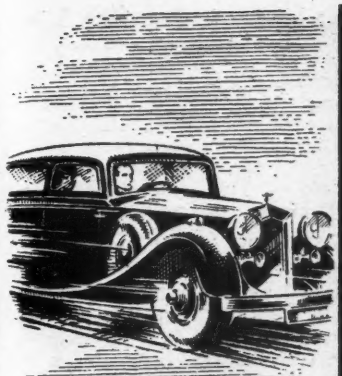
The proposed Bill was monopolistic. No one was to be allowed to start a scheduled service, and the Ministry's advisory council was a sham. Even the three Corporations would have to put up with a good deal of interference in their day-to-day activities. The opposition believed that there should be an executive council similar to the United States Civil Aeronautics Board. An independent tribunal was wanted which would sit in public, have judicial powers, be in a position to license new or competitive routes, and which could receive appeals from independent operators, from private people and from local authorities where their interests were affected.

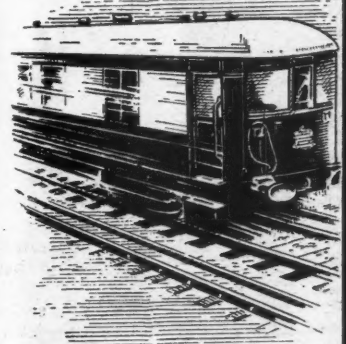
Among the speakers who followed and who criticized the Bill, Mr. Geoffrey Cooper asked for a full-time directorate for the Corporations and for the setting up of an air transport board to undertake technical responsibility and financial and statistical records in the same way as the C.A.B. in the United States. Major Hugh Fraser was also in favour of such a Board. Mr. Mikardo questioned the selection and competence of the Corporation Boards and considered that insufficient thought had been given to the problem of actual management in the aviation industry. Mr. Hurd asked for an assurance from the Minister that he would consult the Minister of Agriculture before taking over land for new civil airfields.

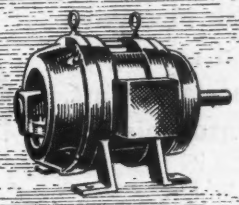
Major Niall Macpherson and Col. J. R. H. Hutchison, in common with other Scottish members, pleaded for a separate Scottish Corporation. Wing Cdr. Hulbert considered that the Bill contained mostly "thou shalt not" and gave little or no encouragement to anyone who wanted to do anything. Cdr. Galbraith claimed that the principal feature of the Bill was that it gave powers with the one hand and immediately took them away with the other. The truth was that the Government has decided that the operational control of civil aviation and its financial management should be placed in the hands of the Minister.

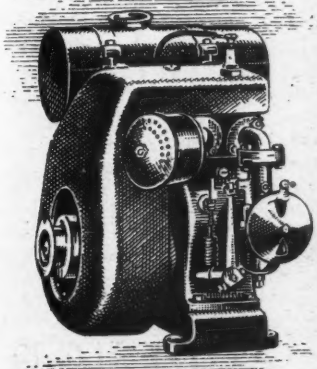
Government Reply

Winding up the debate for the Government, Mr. Ivor Thomas, the Parliamentary Secretary to the Ministry of Civil Aviation, said that it was true that there were some aviation matters which gave anxiety to the Government, the chief one being the supply of aircraft. Even in that case, however, British engines were in a state of development far ahead of anything else in the world, and the designs for airframes were also in a state which augured well for the future. There was already close association between operators and designers of aircraft, he continued, and he assured the House that, from the outset, the Ministry had concentrated, in particular, on jet propulsion for civil aircraft. Jet-propelled aircraft for the Atlantic were, in fact, now being designed.









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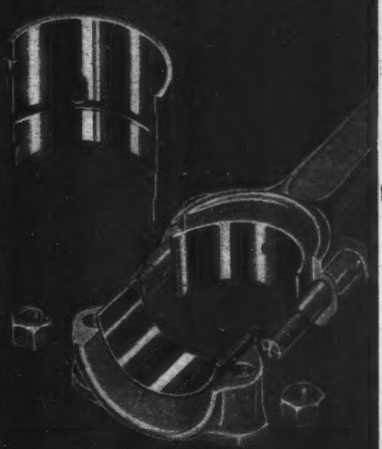

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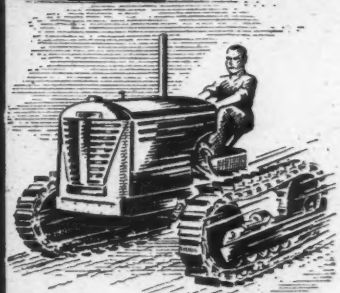

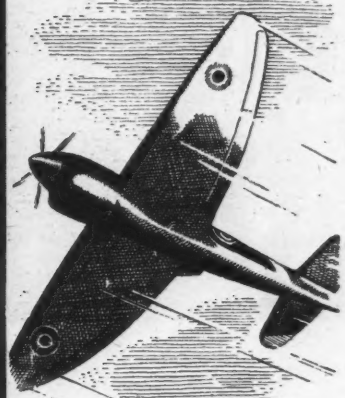

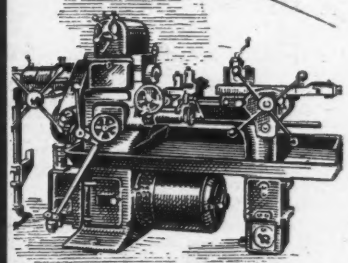

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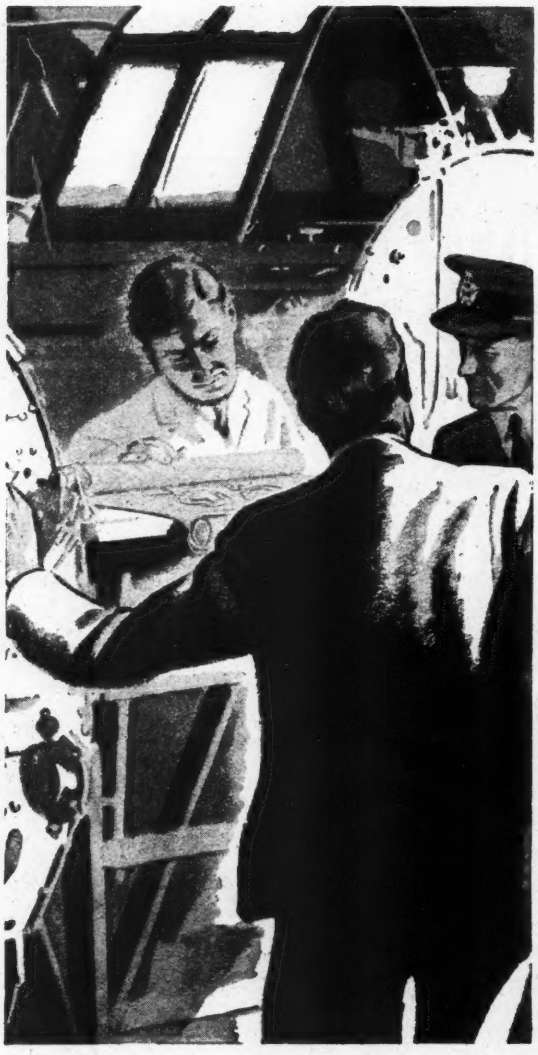

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CIVIL AVIATION BILL

The creation of an air transport board would bring about many difficulties because, in fact, it would have to be a super corporation to run the other three, thus nullifying the Government's policy. As to the suggestion that there should be a board of full-time directors on a functional basis, he still believed that the part-time director could contribute something very valuable to the Boards of our airline corporations. He also believed that the present appointments were exceedingly good ones. He agreed that the Civil Aeronautics Board of the United States had much to commend it, but such a board would not be appropriate to the different policy which had been adopted by this country.

Referring to airfields, Mr. Thomas said that the Government had no great programme to build new airfields up and down the country. There were between 600 and 700 airfields already, and, although many of them were not in the right places for civil aviation, the best possible use of these existing airfields would be made.

He suggested that the Scottish question was a "political stunt." It would not be in the interests of Scotland to have a separate operating corporation; first, because it would involve a small fleet of aircraft which could not possibly produce the high utilization figure which made airlines pay. The higher degree of utilization would be possible with one Corporation running all European services, and Scotland would automatically benefit. The second reason was political; integration of world civil airforces was required, not the splitting up of existing forces.

As to the reserve powers vested in the Minister, he assured the House that they would only be used to give directions after consultation with the chairmen of the Corporations. He added: "If I may so express it, these things will be done on an 'old boy' basis. My Noble Friend (Lord Winster) and Lord Knollys do not normally put on their coronets to address each other."

When the House divided, the Opposition's amendment was defeated by 315 votes to 126.

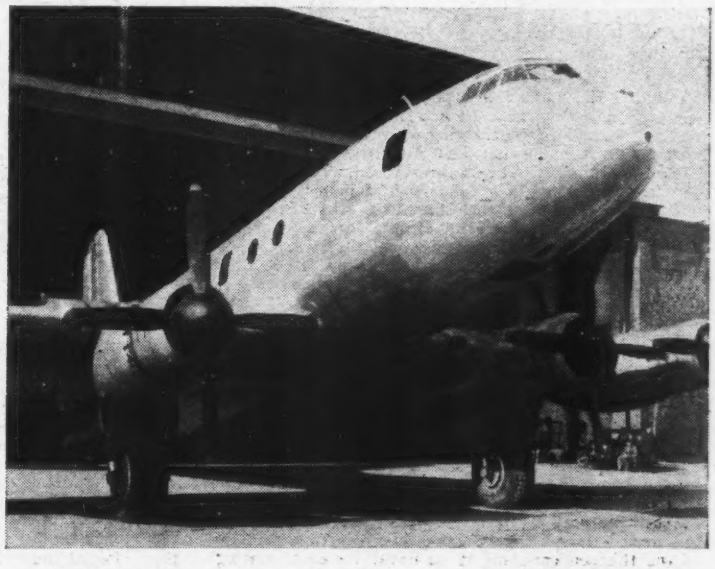
NEW POST

MR. DENNIS H. HANDOVER, who has been Air Adviser to the Air Committee of the British Railways since January, 1944, is, at his own request, being released from this appointment on May 31. With effect from June 1 he is taking up the post of Director for the United Kingdom and Eire of the two Swedish airline operators, A.B.A. and S.I.L.A. Apart from his previous good work with Imperial Airways, Mr. Handover, played an important part in the preparation of the rail-air plan for a European network of services, which was submitted to the Government by the railway companies and their shipping partners in October, 1944.

PACIFIC SURVEY

WHEN the Australian National Airways' Skymaster *Warana* left Sydney on May 3 to undertake the first experimental flight on the Trans-Pacific air service to America, via Fiji, Canton Island and Honolulu, the Australian Minister for Air, Mr. Arthur S. Drakeford, with his wife and daughter were among the passengers. A.N.A. will run the interim service to America until the Commonwealth Pacific Airways Corporation is established and is able to organize its own schedules.

Warana is one of the four Douglas Skymasters which were ordered some time ago for Australian National Airways. All of them have now been delivered.



SERVICE HERMES: A close-up of the prototype Handley Page Hastings, which is the military transport version of the Hermes and which made its initial test flight on May 7. The Hermes is expected to carry a payload of 15,950 lb over 1,500 miles at 254 m.p.h. Other pictures on p. 482.

SOUTHPORT'S AIRFIELDS

THE Town Planning Committee of the Southport corporation is proposing to make an application to the Ministry of Civil Aviation for the renewal of the private-use licences for the Birkdale sands and Hesketh Park landing-grounds. In addition, the corporation has been attempting to obtain the use, as a civil airfield, of the R.A.F. station at Woodvale, but the nearby Formby Urban District Council, supported by the Lancashire County Council, are strongly opposing the plan. In any case, in view of the proposed Ministerial control of all "transport" airfields, it seems unlikely that the local authorities will have a great deal of say in the matter.

EGYPTIAN AIRWAYS

THE Anglo-Egyptian air agreement, the approval in principle of which we mentioned recently, has now been signed by the two Governments concerned and awaits ratification. It provides for the establishment of an Anglo-Egyptian civil air transport company which will be known as Egyptian Airways and have a capital of a quarter of million pounds. The company's shares will be equally divided between B.O.A.C. and Misr Airwork, which is the existing Egyptian national company. The first international service to be undertaken by the new company will operate between Cairo and London.

Egyptian Airways will be granted rights under the agreement, to operate services, with terminals in Egypt, to countries within the British Commonwealth, and also to France, Italy, Greece, and any other countries as may be agreed in future with the Egyptian Government. However, these rights are *not* granted *exclusively* by the Egyptian Government to Egyptian Airways, except for the U.K.-Cairo service.

RECORD-BREAKING SURVEY

WHEN Air Vice-Marshal Bennett returned from his recent survey flight to South America, he said that the countries which he had visited were most anxious to have British co-operation in the sphere of civil aviation. He emphasised that any extension of British South American Airways' services across the continent of South America would be carried out with the complete co-operation of the various countries concerned on such matters as joint routes and mutual bookings. There was no intention to compete with local airlines, of which there were many, Colombia, for example, having twenty-three.

As a result of the survey flight, B.S.A.A. hope to extend to Santiago at least a proportion of their services which, at present, terminate at Buenos Aires. It is also hoped that it may be possible to inaugurate a service to Trinidad, and on to Venezuela and Peru.

During the flight *Starland* covered 14,933 nautical miles in

CIVIL AVIATION

a total flying time of a little over 86 hours, and arrived back at London Airport 36 minutes ahead of its scheduled lapsed time for the round trip. The Lancastrian covered the 6,214 nautical miles to Buenos Aires on the outward journey in a record flying time of 29 hr 5 min.

Incidentally, B.S.A.A. are operating twelve Lancastrians, and are also now due to receive the first of their twelve Yorks. From the beginning of the year until April 30th, the Corporation's aircraft covered 2,717,848 passenger/statute-miles and 61,758 mail ton/miles. In addition, the total freight and stores ton/mileage for the period amounted to 133,289.

NEW FLYING SCOT

THE first Dakotas to be made available by the Ministry of Civil Aviation for Railway Air Services are being introduced on the routes from Glasgow to Belfast and London as from May 20. Three services will operate in both directions every week-day between Glasgow and Belfast, and one service between Glasgow and London.

A substantial reduction in the Glasgow-London fare will accompanyi the introduction of this new aircraft, the single fare being reduced from £9 to £7, and the return fare from £14 10s to £12 10s.

BRISTOL'S FUTURE

AMONG the understandings reached after a visit to Bristol by Sir Henry Self, Permanent Secretary to the Ministry of Civil Aviation, for a meeting with the city's Civil Air Transport Committee was that Bristol will be an important link on the internal routes. It was also stated that the Bristol Channel air ferry service would be re-started in about two months' time. The major request of the Committee—that Bristol could be considered as an emergency airport for the North Atlantic service—was not directly agreed, but Sir Henry thought that the development of Filton, for the testing of the Bristol 167, would result in a useful reserve landing point.

ATLANTIC WEATHER SHIPS

IN last week's issue we noted the P.I.C.A.O. decision to maintain thirteen weather ships in the North Atlantic. In addition, there will be fourteen rescue co-ordination centres in Europe, Iceland, the Azores, Bermuda and in America, with two overland air rescue units based in Nova Scotia and Labrador.

The suggestion is that stations should be either operated by the States in direct proportion to their relative interest, or that certain States should undertake to operate them in excess of their natural "interest" proportion and to be duly reimbursed by the other States. It is also suggested that some of the thirteen craft might be naval vessels operating in the normal course of training duties.

At the Dublin conference it was decided to issue a "North Atlantic Route Service Manual," and this has recently been published. The operating procedures are divided into groups covering airfield and ground aids, air-traffic control, meteorology, search and rescue, and communications. The radio aid section has not yet been drafted. In an appendix to the Manual is a revised draft of the international "Q" code.

SKYWAYS' FIRST YORK

ON Monday of this week the first of the Avro Yorks to be used by the new charter company, Skyways, Ltd., was christened by Lady Heath Eves, the wife of Sir Herbert Heath Eves, the Deputy Chairman of the Anglo-Iranian Oil Company. The ceremony was due to be held at Northolt, but the appropriate name of *Skyway* was given to the aircraft at Langley airfield.

U.K.-AUSTRALIA

THE flying boat route to Australia was reopened last Sunday, when a B.O.A.C. Hythe-class flying boat left Poole, inaugurating a new twice-weekly schedule in each direction. The aircraft will leave Poole on Sundays and Thursdays each week, arriving in Australia on the following Fridays and Tuesdays respectively. B.O.A.C. and Qantas Empire Airways are operating this service jointly, Australian crews taking over at Singapore for the remainder of the flight to Sydney.

The 12,000-mile route is via Marignane (Marseilles), Augusta (Sicily), Cairo, Basra, Bahrein, Karachi and Calcutta, Rangoon, Penang, Singapore, Surabaya, Darwin and Bowen, which is on the Queensland coast of Australia.

BREVITIES

The B.O.A.C. Boeing shuttle service which runs three times a week between Baltimore and Bermuda is now to continue in operation until October 1st.

* * *

A Chilean firm is negotiating in the United States for the purchase of several helicopters for use on an airline to be established between Santiago and Valparaiso.

* * *

A shuttle service, operating three times daily in each direction with converted DC-3s, has been inaugurated between Dublin (Collinstown) and Shannon Airport by Aer Lingus. The fares are £2 10s single or £4 10s return.

* * *

The postal authorities of Britain and Eire are shortly to discuss the transfer from surface mail to air mail of all cross-Channel letters. This was announced recently in the Dail by the Eire Minister for Posts and Telegraphs.

* * *

The Canadian McKee Trophy for 1945, offered for outstanding contributions to aviation in that Dominion, has been won by Mr. G. W. C. McConachie for his work in northern airline operations. Mr. McConachie is now general manager of Canadian Pacific Airlines at Edmonton.

* * *

Squadron Leader L. E. Dalrymple, A.F.C., has recently joined the flying staff of the South Wales air charter concern, Cambrian Air Services, of Cardiff. He will be remembered primarily by pre-war flying people as a test pilot to Miles Aircraft—or Phillips and Powis—and as instructor to the Reading Aero Club.

* * *

Following the Bermuda agreement, the Canadian Government has obtained a 99-year lease of Goose Bay airfield in Labrador. Canada, it is learned, may also use the primarily civil airfield at Torbay, Newfoundland, for military purposes, and may also take over control of Gander airfield in case of any future emergency.

* * *

Owing to the demands made on Tasman Empire Airways' flying boats for the carriage of mail, there is now a long passenger waiting list for air passages from New Zealand.

* * *

According to rumours in Ottawa the possibility exists that the Government's intention of divorcing airline operation from that of the railways may be changed. In 1944, it was announced that this policy would take effect one year after the end of the European war. An extension of a year has already been granted to Canadian Pacific Air Lines, and new companies may be allowed to operate inter-city feeder lines.

CZECHOSLOVAKIAN REVIVAL: A development of the Be-555, a new 2-3 seater, the Sokol, has been produced by the successors of the pre-war Benes-Mraz concern. It has a retractable undercarriage and a maximum speed of 150 m.p.h. when powered by a 105 h.p. Walter Minor. It is planned to use a variable pitch airscrew on later production models.

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Illustration of "Ambassador" by courtesy of Airspeed, Ltd.

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American Newsletter

Light Aircraft Over-production : What of the True Market? : Helicopter Common Sense : False Performance Claims : Penalizing Contractors

By "KIBITZER"

EXPERIENCE in the aircraft trade teaches one some basic rules of thought and behaviour. These vary from such elementary practical ones as "Never start up an aircraft without chocks . . . always watch a landing . . . and keep hold of your glass in the bar," to "Never shoot a line and never prophesy about the industry." At the risk of receiving a sharp rap over the knuckles, however, the writer is prepared to go on record as saying that if the American manufacturer of private-owner aircraft sticks to his present production schedules, he is heading for a first-class slump.

To someone on the outside it is quite impossible to see how all the machines that are to be built between now and December, 1948, are going to be absorbed. That there is a wave of buying to-day cannot be denied. But this is due largely to a dammed-up demand and to the release from the Air Forces of a large number of men and women who would like to continue to fly. Once this false market has been filled, trade must depend on the newly taught pilot. Unfortunately, by the time he is ready to buy, a large number of those who purchased machines in the first rush will find that, for one reason or another, they do not after all want to fly, and will sell. Thus a second-hand market will be created which may well bring the domestic sales of new aircraft to a standstill.

Naturally, there are factors which can prevent this finale—strikes, lack of materials, a failure to reach the optimistic estimated production figures, or the long-sightedness of the manufacturers themselves who may voluntarily cut their output. The opening-up of overseas markets might help to absorb the surplus. But the fact remains that not only do these expected sales look optimistically high, but there must also be some drastic changes in the design of the aircraft if the mass of the population is to fly in the numbers being suggested at the moment. It may not be too rash to say that the light private-owner aircraft of to-day can *never* supply a mass need, and that only the helicopter, as it may be in five years' time, can do so.

All of which sounds rather drastic. But is it? Take only the 1946 estimated production figures of five of the light aircraft manufacturers over here. They are: Ercoupe, 10,000; Taylorcraft, 8,000; Piper, 7,000 to 8,000; Swift, 4,000; and Republic, 4,000 This does not take into account the output of such factories as Stinson, Aeronca, Bellanca, North American, Beech, Fairchild, Cessna and several others.

Flying Simplification

There are supposed to be 300,000 people in the United States who want to fly their own machines. With the light aircraft in its present form—and between 1938 and 1943 an average of one in every 115 civilian aircraft was involved in fatal accidents, half of which were spin-ins—it is hard to believe that all these people will be competent to deal with the difficulties of flying as we know them to-day. Of those who are, there will be a further percentage who will cease flying once the novelty has worn off. To be honest, one must face the fact that there are difficulties and inconveniences associated with private flying which still keep it in the enthusiast rather than the utility classification. Whatever anyone says, it is both more difficult and more dangerous than driving a car—and much more expensive. Therefore, one believes that, although people will most certainly continue to fly, they will not do so as private owners. And, moreover, that the type of aircraft which they will use must be drastically improved.

Public opinion, a mounting accident rate, competitive design, and Government and insurance requirements must force development along the lines of safety above all. Machines *must* be built which are really stall- and spin-proof. Controls must be reduced in number and simplified still further; landing and slow-flying speeds must be brought down to a 20-miles-per-hour basis; visibility must be improved; noise levels reduced; fire hazard eliminated; landing made easier; night-flying and landing, and bad-weather flying aids must be introduced; icing dangers must be removed; and even aircraft-saving parachutes must be introduced.

Added to these innovations, airport facilities must be improved not one hundred but two hundred per cent. When this is done, flying in a stationary-wing aircraft might be considered to be satisfactory. There will then be room for operators who hire out aircraft for short local flights, or for those firms who can develop a widespread hire-and-fly-yourself network. This latter field is perhaps the greatest of all and represents the type of private flying which will replace that of the private owner. It is a scheme that needs excellent organization, however, as well as imagination, continent-wide facilities and specially designed aircraft. The first people to do it properly will make a lot of money, and it is believed that some such organization is even now preparing to start operations on a nation-wide scale in the States.

There will probably be many people who will disagree with the statement that, for short flights, and as a replacement for the family car, the helicopter is the only answer. Personally, one cannot visualize anything else, although it must be clearly stated that this applies to short-distance flights, where ease of transportation rather than speed is of paramount importance. Before criticizing the helicopter for some of its more obvious existing faults, it would not be a bad thing to stop and realize that, whereas the aeroplane has had some forty years in which to develop, the direct-lift, rotary wing machine has had only seven or eight. If the tables were reversed, where would our fixed-wing aircraft be?

For Specialists Only

There are now two types of helicopter in the States for which C.A.A. Certificates (the American equivalent of our C. of A.) are about to be issued. These are the Bell and the Sikorsky. Of the two one prefers the former—perhaps because of its greater stability—but that is a matter of personal preference only, and both are perfectly suitable for those types of operation which cannot possibly be done by any fixed-wing aircraft.

The trouble is that the super-enthusiastic supporters of the helicopter have over-sold it and done it, and themselves, an immense amount of harm. As Mr. Larry Bell, of the Bell Aircraft Corporation, so wisely states, "They've now talked themselves into a state where the public is over-rating the value of this type of aircraft while the industry and the armed services are under-rating it."

In outlining his future programme before a Wings Club luncheon some weeks ago, Mr. Bell made it perfectly clear that for the next two or three years he visualized his machine as being suitable for specialized uses only. During that time he expected to get a mass of operating data from the 500 aircraft they will sell in 1946 and 1947, and to be far enough along on a development programme by the end of, say, 1948, to tap, perhaps, the open market. Until then, however, Bells will sell only to the specialist operator, and then only after a full course of maintenance and flying instruction.

All this makes a great deal of sense. It is a basically sound and, yet, progressive way of tackling a problem about which there has been a great deal of confused and sometimes reactionary thinking.

Every Government and every Air Force has, at one time or another, been worried about the ways in which a contractor should be penalized if one of his aircraft, whether experimental or production, fails to fulfil its contractual guarantees. In extreme cases the question of whether the machine is even to be accepted at all can arise. Whereas a civil type of aircraft may not sell if it fails to meet its specification performance, a government agency, if it places an order for a military type, may have to accept delivery. Added complications arise if optimistic sales departments issue exaggerated pre-flight claims for performance, and in more than one case such an action has caused subsequent embarrassment both to the manufacturer and the Air Force concerned.

It is unfortunate that there has been, and to a certain extent

AMERICAN NEWSLETTER

there still is a tendency in the American aircraft trade to put undue emphasis on the importance of speed. This outlook is often fostered by unwise newspaper publicity, the non-technical journals making claims which it is impossible to substantiate. In the English papers, too, performance figures have appeared which obviously could not be realized, and which, instead of boosting British prestige, tended to detract from the value of statements which did happen to be correct.

Probably because they realize the folly of this sort of thing, and because continual exaggeration must have an adverse effect on overseas markets, the U.S. Army Air Technical Command have been devising ways and means of preventing it, and have revived a scheme which, it is hoped, will not only discourage irresponsible claims, but will aid the manufacturer who is able and honest in his performance forecasts.

In effect, this policy would levy financial penalties for deficiencies in aircraft performance. In the main, such penalties, with the exception of that over top speed, would be determined by negotiation between the contractor and the government. For V. max, however, a system of curves has been worked out by Air Technical Command which would determine the price adjustment to be applied if the aircraft failed to meet its guaranteed speeds. A flight test error of 1 per cent is allowed, and on top of that there is a further tolerance of a 1 per cent performance drop which carries no penalty. After that, however, the graph takes a most ugly trend from the manufacturer's point of view. As the speed decreases below that guaranteed, so the curve falls, and the percentage reduction in contract price increases rapidly until the line finally plunges to a point where the aircraft is unacceptable.

Take, for example, a machine which is guaranteed to do 630 m.p.h. at 30,000. There would be no penalty for a drop of 6.3 m.p.h. (less an allowance of 1 per cent for flight-test error), but a failure to meet guarantees thereafter would carry increasing financial deductions, until a drop of 34 m.p.h. would exact a penalty of 10 per cent of the contract price. If the machine were down 45 miles per hour, however, it would be unacceptable. In order to take care of compressibility on really high-speed aircraft, there is a Mach number curve which overrides the price-reduction curve. This tolerance is based on the maximum Mach number so far obtained by any conventional aircraft in the United States at the time of the tests.

Such an endeavour on the part of the U.S.A.A.F. to make the manufacturers toe the line is both brave and interesting, but the conditions are hardly likely to be popular, not only because they hit where it hurts most—in the dollar-plexus—but because they do seem a little harsh—particularly if the aircraft were designed around an Air Force specification which might conceivably limit the designer in his ideas. There is also bound to be an argument over the figures obtained during the flight testing—but this will not be such a good battleground as it might have been prior to 1943. During the war the requirements covering flight testing and performance reduction at Wright Field were completely re-written, and as a result of a great deal of work put in by a Committee (on which the British, the U.S. Army Air Forces and the U.S. Navy were represented), a definite schedule of tests for military types was produced and the methods for the reduction of performance agreed upon. In that respect the manufacturer should know what he is up against before he starts.

* * *

There is still no official news regarding the American attempt on the world's speed record, but two inter-related items of news are not without significance. A statement has appeared in the Press that a radio-controlled P-80 is being prepared, on which it is proposed to investigate high-Mach number characteristics. This looks as though the U.S. Army are being particularly cautious, perhaps wisely, in their approach to this problem. The second point of interest is that the National Aeronautics Association, who are the controllers of "sport" flying in the States, are likely to press for the abolition of the 250-foot maximum-height requirement for any record attempt, and have appointed a special committee to investigate the use of radar and other similar devices for the timing of such records.

["Kibitzer's" opinions on the American light aircraft production situation are interesting. For some time we have felt that this situation resembled the South Sea Bubble in more ways than one. Some time ago "Indicator" suggested that the only practical system for private flying in this country would be, in the present stage of aircraft development, some form of "fly-yourself" hire arrangement on a really big scale—thus pooling all maintenance costs and ensuring continuous availability. In his recent article "Let us Be Honest," he also stressed the vital importance of issuing accurate (or even under-estimated) performance figures.—ED.]

FROM THE FLYING CLUBS

THE new West London Aero Club, which will operate from White Waltham airfield, the old A.T.A. headquarters near Maidenhead, should be in flying operation next month. It has, appropriately enough, been formed by four ex-members of A.T.A.—the Hon. B. L. Bathurst, Mr. Peter Mursell, M.B.E., Mr. Ronald Malcolm and Mr. W. G. Metcalfe—and, until suitable premises have been allocated, the officers' mess at White Waltham will be used. The fleet will eventually consist of three Moth Minors, three Austers and three Hornet Moths, and the flying charges will be in the region of £4 per hour, with fly-yourself-hire arrangements on a daily basis.

* * *

THE Herts and Essex Aero Club, which was founded in 1930, is shortly to return to life at its pre-war headquarters at Broxbourne Airfield, Nazeing, Essex, where work on aircraft repairs and modifications continued during the war. One Tiger Moth has already been obtained and two Austers have been ordered. It is expected that the flying charges will be about £3 an hour and flying should be started next month, with the clubhouse facilities ready during this coming week-end. Messrs. A. R. Frogley and F. E. Darlow, as well as other familiar Broxbourne inhabitants, will be managing operations. The Broxbourne telephone number is Hoddesdon 2453.

* * *

AT the beginning of this month the Fair Oaks Aero Club started instructional flying, using an Auster and a Gipsy II Moth. Three Tiger Moths, which are at present being overhauled, should shortly be available, and both blind and night flying instruction will then be undertaken. The normal charges are £4 an hour for the Auster and £4 10s an hour for the Gipsy and Tiger Moths. The club is being operated by Airtraining (Fair Oaks), Ltd., at Chobham, near Woking. Fair Oaks is, incidentally, a "free" airfield, where flying visitors can be received and "coupon" fuel provided.

* * *

SINCE the opening on March 2nd, the Luton Flying Club fleet has been increased to eight aircraft—if a Link trainer, which is now being installed, can be included. The seven real aircraft consist of four Tiger Moths, two Proctors and an Auster, which will be available next month. The flying charges are now £3 an hour for the Tigers; £5 5s an hour for the Proctors; 10s per hour for the Link trainer; and—it is expected—£2 2s an hour for the Auster. These rates are slightly increased during the week-ends. Night flying facilities should soon be available. The club has been usefully busy in its ten weeks of life, and six new "A" licences as well as sixteen renewals have been scored.

* * *

Following last week's announcement that the Brooklands and South Coast Club are to be combined at Shoreham, we hear that the reconstituted club is to be opened on June 29th with a preceding dinner on June 21st. More details will be published in due course, but, in the meantime, prospective members should contact Brooklands Aviation at Weybridge.

FORTHCOMING EVENTS

May 18th.—College of Automobile and Aeronautical Engineering, Chelsea; Old Students' reunion dinner, Gt. Eastern Hotel.
May 24th.—Cambridge U.A.S. 21st Anniversary dinner, University Arms Hotel.
May 30th.—R.Ae.S. The 34th Wilbur Wright Lecture, by Mr. E. L. Relf (I.C.E, Gt.. George St.).
June 1st.—R.Ae.S. Reading and Dist. Branch: Aeronautical Garden Party, Woodley.
June 15th.—Old Cranwellian Assoc. reunion, R.A.F. College
June 15th—No. 150 Sqn. R.A.F. reunion dinner, Dorchester Hotel, 6.30 p.m.
June 22nd.—Air Pageant, Southampton Airport.
June 30th.—Northern Heights M.F.C. Gala day, Langley Airfield, Nr. Slough.

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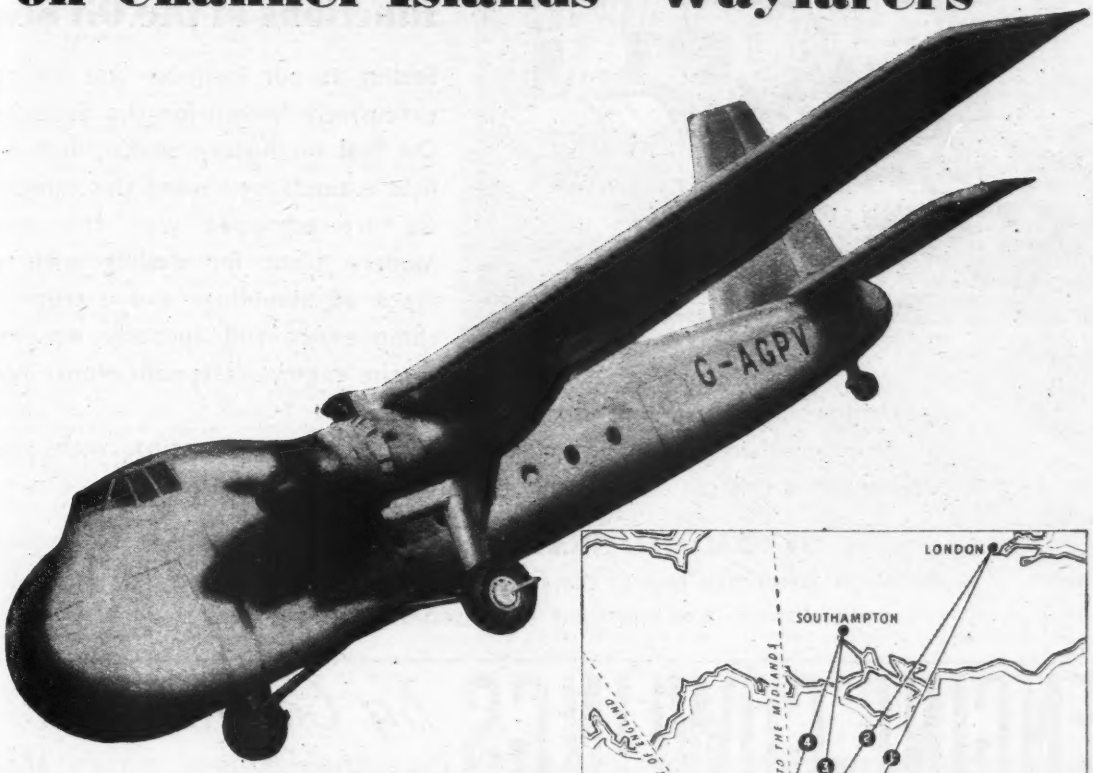

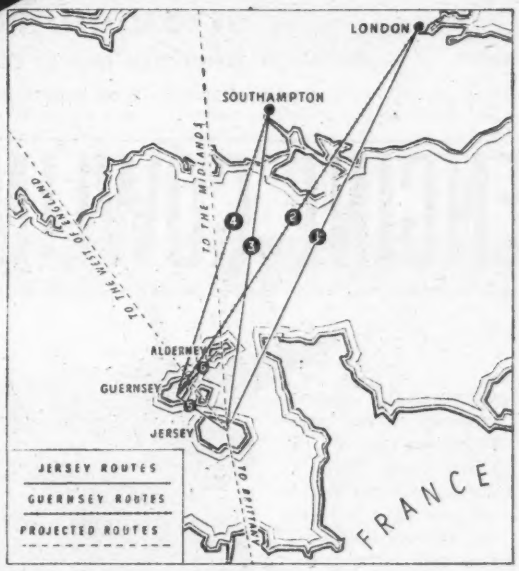

(1)	JERSEY - LONDON	177 MILES
(2)	GUERNSEY - LONDON	174 MILES
(3)	JERSEY - SOUTHAMPTON . . .	127 MILES
(4)	GUERNSEY - SOUTHAMPTON .	119 MILES
(5)	JERSEY - GUERNSEY	27 MILES
(6)	GUERNSEY - ALDERNEY . . .	28 MILES

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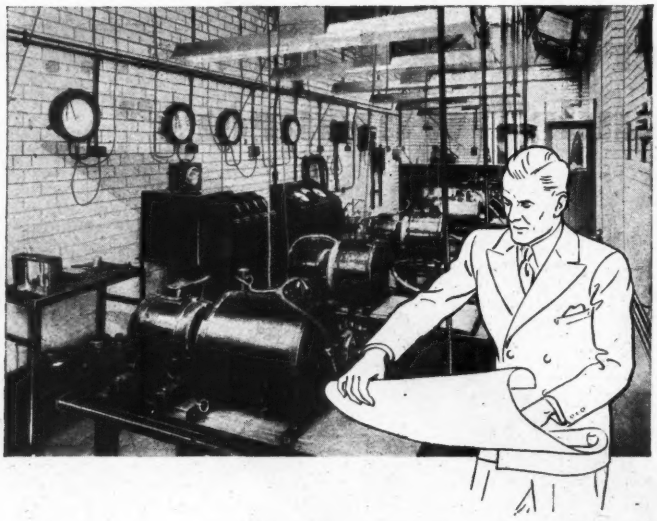

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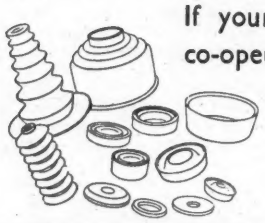

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FROM ALL QUARTERS

MARINE RADIO CONFERENCE

SPEAKERS at the International Conference on Radio Aids to Marine Navigation now taking place at the Central Hall, Westminster, have said much which is of interest to aircraft operators. The conference was opened by Mr. A. Barnes, Minister of Transport, on May 7th and continues until May 22nd. The objects are to inform other countries of what is being done in this country in the field of radar and radio aids to marine navigation, and to seek information on similar work in other countries.

The Parliamentary Secretary to the Admiralty, Mr. J. Dugdale, at the opening meeting said that the Admiralty Signals Establishment have produced a specifcation for a marine radar set in agreement with the British Mercantile Marine, which would provide the merchant ship with the best compromise between what it required and what science could at present assure.

Sir Robert Watson-Watt, elected Chairman, said that none of the radio devices, radar or non-radar, which had emerged during the war was in a form ready for immediate application to the special needs of the merchant navies. "We believe that international standardization of devices is essential to the efficiency and commercial attainment of those standards of safety, regularity and punctuality which are demanded by every major form of transport."

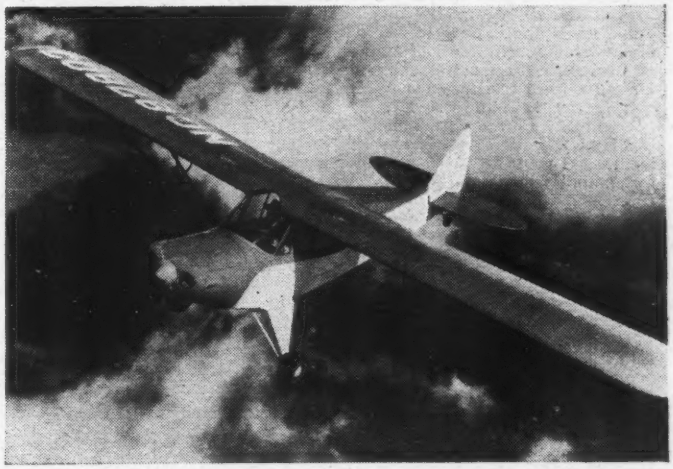
Captain R. W. Ravenhill, D.S.C., R.N., speaking on problems of navigation with special regard to bad weather areas, said that the coasts of Western Europe, East and North America, Bay of Bengal, and the South China Sea are areas that immediately spring to mind as being high on the priority list for radio aids.

Discussing outstanding problems Dr. R. L. Smith-Rose of the N.P.L. said: "There is a conspicuous lack of precise knowledge of the speed at which radio waves of all frequencies travel over various types of terrain and through the atmosphere."

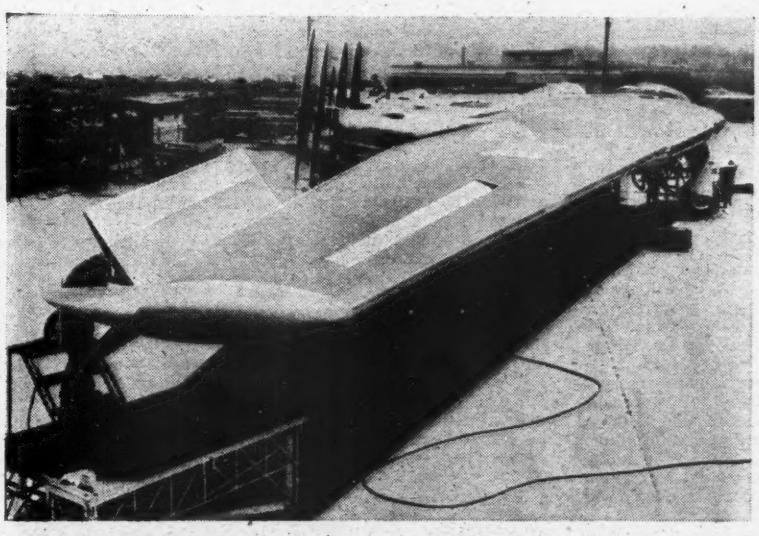
Describing the operation of the Consol navigation system (code signal 7-H-7 on 1,140 metres) Mr. Caradoc Williams of the Royal Aircraft Establishment said the German system formerly known as Sonne had been in service for a considerable time and the development of a British system embodying detailed improvements was nearly complete. Consol provided long-distance navigational aids for ships and aircraft, using automatic transmission beacons on the ground and a standard M.F. receiver. It provided bearing indications of a ground beacon up to distances of about 1,500 miles over sea and 1,000 miles over land. One German station was still being operated at Stavanger, Norway, and a station using British-designed equipment was being erected in Northern Ireland. The complete cycle of operation of German beacons took two minutes, and the first British station will operate at twice this speed. The estimated capital cost of a station to provide a 24-hour service was from £15,000 to £20,000.

A system called Popi (Post Office Position Indicator) also operating in the M.F. band, was described by Mr. C. D. Smith, who said that further development of the system was being carried out by the Ministry of Supply, who will design and erect a prototype installation for full scale trials.

Mr. H. E. Hogmen of the Admiralty Signal Establishment said that rain drops cause echoes which may be picked up by the latest radar sets, and it has been calculated that for a three centimetre ship radar the echo from a patch of heavy rain one kilometre thick at a range of 10 kilometres could obscure the echo from a merchant ship.



THE NEW PIPER: With its 100 h.p. flat-four Lycoming engine the Piper PA-12 cruises at a speed rather over 100 m.p.h., and is some 25 m.p.h. faster than the pre-war J-5 type which it replaces. The all-up weight is 1,750 lb, and the price, in America, is about £725. Unusually in this type of aircraft, a car-type starter-generator has been standardised.



DIRECTION BY DRAG: Similar to the air brakes on former Northrop bombers, the wing-tip drag rudders on the all-wing B-35 are of the double split type. Also visible in the photograph is the starboard slot which except at low speeds is covered by a door, automatic in operation, and provided to restore a smooth wing surface for high-speed flight. The top speed of the bomber is calculated to be about 400 m.p.h.

LLEWELLYN OLIVER MOSS

IT is with regret that we record the death on May 9th, in a test-flying accident, of Mr. Llewellyn Oliver Moss. Mr. Moss, who was 51 years of age, was chief production test pilot of the Gloster Aircraft Company.

After serving in the Dorsetshire Yeomanry in the first European war, he transferred to the R.F.C. and remained in the R.A.F. Reserve. At the outbreak of the second European war he was considered too old to fly with the R.A.F., and therefore joined the A.T.A. Later, he was in charge of the A.T.A. Brockworth pool, and, in view of his good work, was employed in 1942 by Glosters as production test pilot on the Typhoon contract. More recently Mr. Moss had been carrying out production tests on Meteors and had also helped with development work on this type.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

AN N.A.A. MUSEUM
Is it Really Desirable ?

DO we really want to multiply museums in the way suggested by your leading article and by your correspondents "Nostalgic" and E. Watts?

There are at present four major museums capable of, or at present dealing with, civilian and/or military aircraft, from either the technical or historical point of view, viz., the Science Museum at South Kensington, the Imperial War Museum at Lambeth, the National Maritime at Greenwich, and the Royal United Service Institution in Whitehall.

Only the S.M. and the I.W.M. have room, apparently, to house a few of the actual machines, but for the most part the large variety of types must necessarily be illustrated by models. This being so, I submit that the appropriate place for exhibits relative to the N.A.A. is one or other of the above-mentioned institutes.

H. FOSTER.

LIQUID IGNITION
No Novelty in the Ring Process

THE description of the Ring process given in *Flight*, March 14th, 1946, and entitled "Liquid Ignition," is of interest. The idea disclosed by the Ring process is not new and a British gas engine (National Gas Engine Company, I believe, although I am not in a position to make a literature search) using pilot injection of diesel oil for ignition of town gas was described in *Engineering* some years ago.

The use of the higher glycol ethers as an injected ignition liquid is likewise not a novel idea and was considered for aircraft engine use in this country several years ago without any knowledge of German work in this field.

S. D. HERON.

Detroit, U.S.A.

FUEL AND WEIGHT
Power Taken by Superchargers

THERE may be something in what "Mixture's" flight/eng leader claims (*Flight*, March 28th)—that identical aircraft, operating at identical boost and revs, but at different all-up weights, would have different fuel consumptions.

If there is indeed a difference in consumption (gal per hour), it is probably due to the quite simple fact that the lighter aircraft, by flying faster and thus receiving greater ram effect, does not require quite so much power to drive its superchargers, as they have slightly less work to do.

The amount of power absorbed in driving superchargers is very great, and any reduction in the power needed would naturally effect an economy in consumption. Such economy would be most noticeable at full-throttle height.

R. H. HENDERSON.

REWARD FOR SERVICE
Is Halton a Handicap?

I WAS most interested to read the letter signed "Wing Co., Rtd." (*Flight*, April 18th) *re* the lot of the ex-aircraft apprentice. He hits every nail on the head. I am fully aware of the raw deal the ex-aircraft apprentice gets.

My husband is an ex-Halton boy. He has been a flight sergeant for four years (two years acting and two years temporary), and it seems extremely probable that he will remain in that rank for the greater part of his further 15 years' service.

He has the view that the chances of a permanent commission are very slim indeed, and after reading the Wing Co.'s letter I can understand why he thinks so.

My husband entered Halton straight from secondary school, passing out from Halton as a fitter armourer. He was made leading aircraftman just before the outbreak of war, and was promoted corporal on his return from France in, I think, June, 1940. He was made sergeant in, I think, April, 1941, acting flight sergeant in July, 1941, and temporary flight sergeant in 1944, and there it seems he will remain except for possible promotion to warrant officer.

His heart and soul is in the R.A.F., hence his signing on for a further 12 years. He would not apply for a commission during the war in case at the end of hostilities he should be kicked out of the Service; he preferred to stay in the ranks. Naturally he wants to get on in the Service, but, as the Wing Co. stated, what chances have the ex-apprentices, even though they are the best-trained technical men?

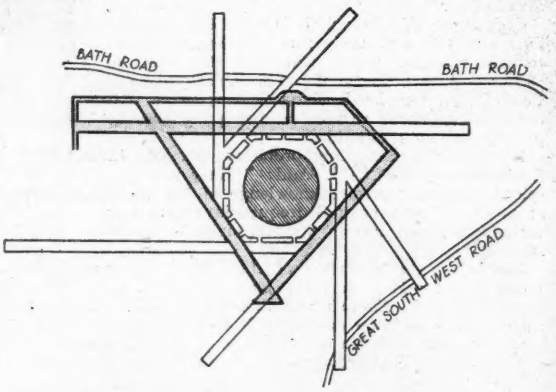
My husband has had secondary education, has technical and administrative experience, is intelligent, keen on sports, etc., and lives for the R.A.F. What more is expected of a man who wishes to become an officer? Is it that he should *not* be an ex-aircraft apprentice?

Thank you indeed, "Wing Co., Rtd.," for bringing to light the lot of the ex-aircraft apprentice.

EX-AIRCRAFT APPRENTICE'S WIFE.

LONDON AIRPORT
A Superimposed Tangential Pattern

I READ with much interest the article in last week's *Flight* (April 25th) on the London Airport. The statement made in the House of Lords on April 10th by the Minister of Civil Aviation seems to bring out one main point, namely, that the Government will not take the large view and admit to having been wrong over the runway pattern for what has been called Heathrow for ages and has now been renamed. This is, apparently, in an attempt to pacify the taxpayer, who may be cross if he thinks that his money has been wasted. Time has shown that the public is, generally, far more forgiving to a sinner who admits the sin openly than to one who tries to cover it up and thereby makes matters worse.



That the tangential pattern of runways is the best for a large civil airport there can be no doubt in anybody's mind—even in the Minister of Civil Aviation's were he honestly to examine himself. Why, then, not admit it, and scrap any plans for parallel or triangular systems?

I enclose a rough drawing of a way of superimposing the tangential pattern on the present triangle at Heathrow. This, I believe, I have managed to do utilising the major portion of what is already built, to its maximum advantage—a point that seems to be uppermost in Ministerial minds, regardless of the result.

I would be grateful if you would use your influence to bring this scheme before the necessary experts for their comments.

CRITIC.

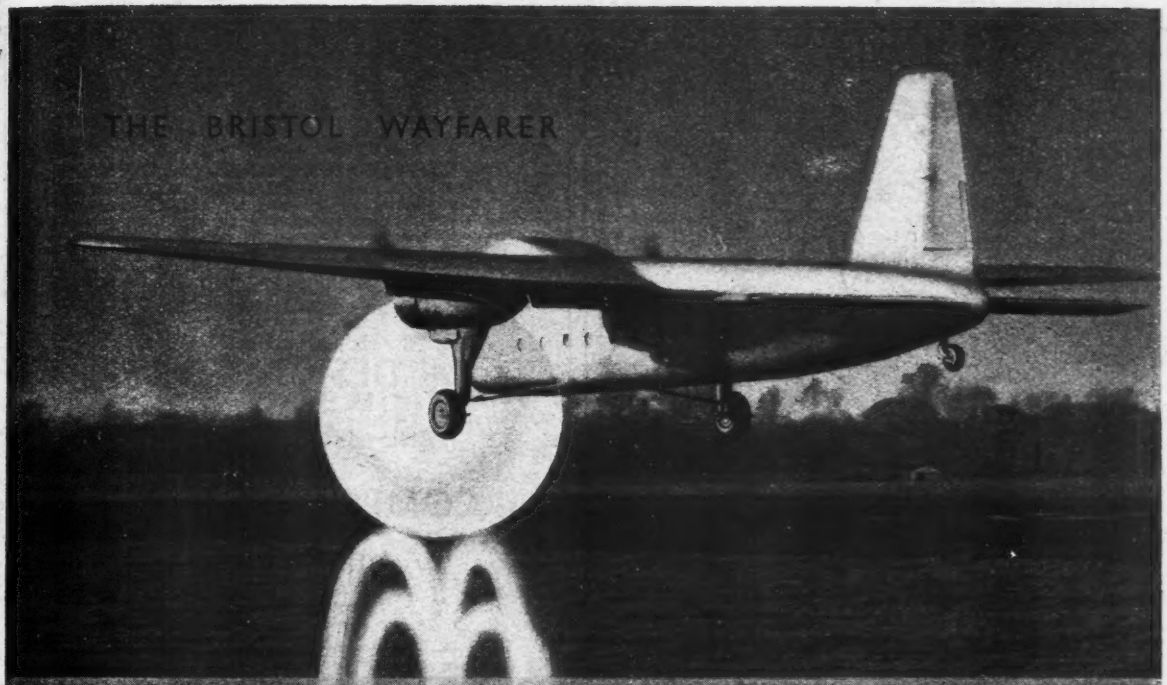
ON BEING C.G. CONSCIOUS
Some Existing Service Provisions

ALTHOUGH concurring with Mr. Howard's views on "being c.g. conscious (*Flight*, March 7th), I think the following remarks may assist in clarifying this subject.

It is preferable that "overloading" and "correct loading" be treated separately, since the former, apart from its adverse effects on take-off and landing performance, and stresses in the alighting gear, has no direct bearing on the stability.

The designer is certainly the only person to indicate the permissible c.g. travel, but since he is not involved in the routine of day-to-day safety it is thought that the user is in a better position to compile practical loading charts, for he is fully aware of the local conditions and variety of loads.

Apart from explicit information contained in R.A.F. aircraft handbooks and similar information in U.S.A. technical orders, R.A.F. commands had made it a rule to display in all types converted to passenger, communication or freight pur-



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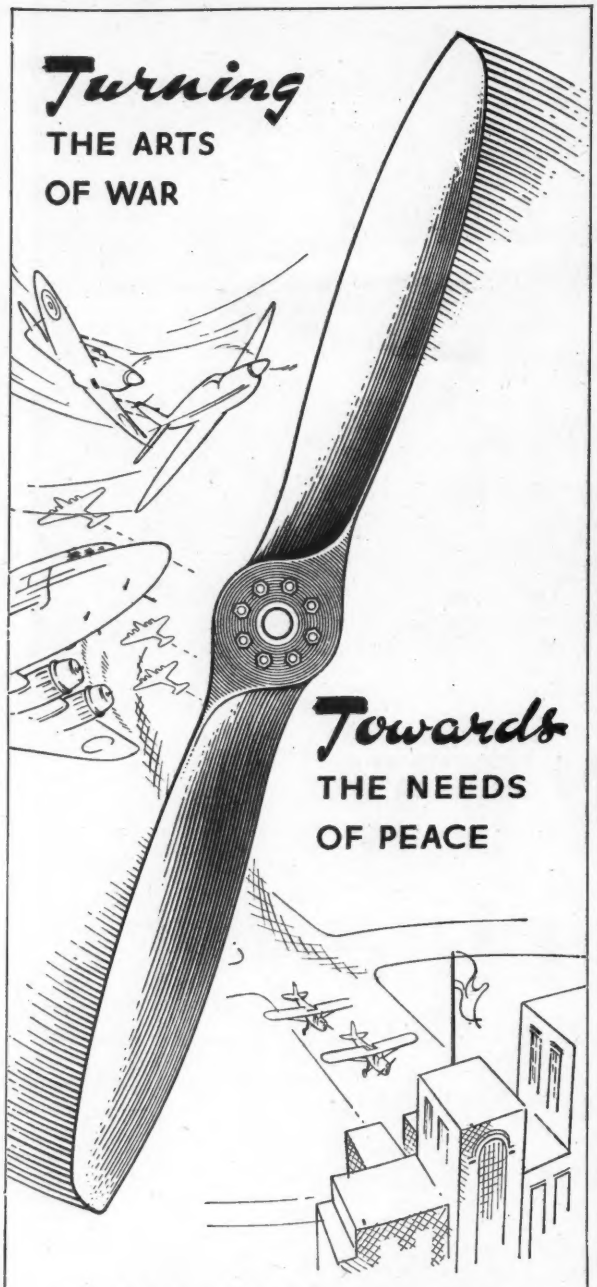
THE ARTS
OF WAR



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THE NEEDS
OF PEACE

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CORRESPONDENCE

poses, ingenious load charts. Such charts, of an admirable lay-out, were included in R.A.F. handbooks for types used in airborne operations, where the c.g. problem and changes in flight are most critical. Transport Command's endeavour to promote c.g. "consciousness" through humorous posters was also considerable.

Load charts are not the only solution. Aircraft of American manufacture were delivered to the R.A.F., together with their airborne "load adjustor." This was a beautifully made multi-coloured slide rule giving the c.g. limits and position for all conceivable service loads. There is no reason why this device cannot be improved and adapted for civil freight routine. Another device, now obsolete, but yet convenient, was the "loading calculator"—a rather expensive ground item with a knife-edge suspended scale section of the aircraft and a set of small weights representing loads. No matter which device is used, the time for the creation of "air stevedores" is not far off. Transport Command is already entrusting the stowage of aircraft in its main airfields to personnel particularly conversant with the problems of the c.g.

Judging from the changes of c.g. position of the Wellington, when the tail gunner goes forward, or the behaviour of the old Bombay when a passenger walked aft, one is inclined to believe the story about the two fat ladies quoted by Mr. Howard. Yet this is not the only "dynamic" aspect of the question. Consumption of fuel, particularly that placed in post-design overload tanks, jamming of the undercarriage, etc., can cause the deterioration of a borderline c.g. position, when taking off, to an out-of-the-limits position in flight and thus constitute contributory, if not dominant, factors of some unexplained accidents.

Finally, whilst admitting that prevention is better than cure and that an experienced pilot should be able to "smell" incorrect loading as soon as he gets in level flight, it is thought that a universal practice to flight-test new and ex-overhaul aircraft in loaded condition and extreme c.g. positions, thus eliminating any aerodynamic trim defects, will assist user-pilots in deciding on the extent of incorrectness of the loading and if it is necessary to land again.

Durban. P. J. YANGOS, Wing Cdr. (Rtrd.).

FOR THE BOOKSHELF

"Front Line Radar," by Sqn. Ldr. C. A. Martin. Forster Groom and Co., 1s 6d.

THE story of the travels and adventures of eight small mobile signals units from the time they landed in Normandy until V.E. day makes instructive and exciting reading. In his personal narrative, Sqn. Ldr. C. A. Martin, Officer Commanding these units, tells us of the work his R.A.F. (Eureka radar) "Beacon Boys" did in aiding the 2nd T.A.F. aircraft to navigate to their targets.

First printed in Brussels as a souvenir record for members of the units, this little booklet includes an appreciation by Air Marshal Sir Arthur Coningham.

"Radar," by Maj. R. W. Hallows, T.D., M.A. Cantab., A.I.M.E.E. Chapman and Hall, Ltd., 7s 6d.

ONE of the most fascinating scientific developments of the war, radar was used by thousands of men and women in uniform but understood by very few. Security regulations naturally placed radar equipment in the most secret category and now when such secrets may be told, few have the knowledge to do so and little has been written about it. Maj. R. W. Hallows, wartime Chief Instructor in anti-aircraft (radar) fire control, is the author of *Radar*, a most interesting book which explains the theory and applications of radar in terms which can be understood by everyone. With the aid of many simple diagrams the author describes ether waves and wireless waves and makes clear the principles of the cathode ray tube. In subsequent chapters he explains the operation of radiolocation equipment, H_2S, etc.

General Sir F. A. Pile writes in his foreword, "This book would have been of great value to us all in the past five years, and today it will be welcomed by hosts of people who are interested in this new scientific development."

"Merchant Airmen." H.M. Stationery Office, 2s net.

AS war ended in one theatre after another, so, little by little, stories of campaigns and of untold gallantry began to be unfolded. Some of them have appeared as official accounts, some as personal reminiscences, but each has produced its share of surprises. Perhaps, however, one of the biggest surprises to many people will be found in the history of some of the men who flew abroad unarmed and nearly always unescorted. No better name for them could possibly be found than the title of the book which attempts to tell their wartime history—*Merchant Airmen*.

I say "attempts to tell" advisedly. The real story would fill many volumes of the size of this book: To cover such a story within the compass of 208 pages is patently impossible, and yet *Merchant Airmen* succeeds in what it has set out to do—namely, to give the public, for the first time, some idea of its debt to the ground staffs who maintained and handled transport aircraft, and to the pilots who flew them over thousands of miles of land and sea, frequently over uncharted air routes, where not only were there perils from the enemy, but equally vicious perils from Nature herself.

There was no form of transport operation which was not undertaken by these men, and the part played by a fleet of Imperial Airways Empire flying boats, augmented by an assortment of aircraft such as was available to B.O.A.C. during the most difficult early war years, makes engrossing reading.

Merchant Airmen describes itself as an "Air Ministry account of British Civil Aviation, 1939-1944, prepared by the Ministry of Information"—a prosaic description which hardly does justice to the contents. It is capably produced, excellently illustrated and, although inclined to be factual, it unbends from time to time in order to describe to us in picturesque language some remote part of Africa or Arabia, or to quote some anecdote which makes one feel that the writer is drawing on his own experiences. Incidentally, many of the descriptions of places are really first class—even to one who knows these places well.

Perhaps the one criticism which can be made is that, although a very serious effort has been made to make the reader understand the appalling difficulties which were involved in pioneering new routes across Africa and round the South Arabian coast in wartime, the effort has not entirely succeeded. Perhaps it was hardly to be expected. To convey on paper, for the uninitiated, a real idea of the incredible problems which had to be solved, or of the appalling conditions of heat, high humidity and the like which had to be endured, would have been well-nigh impossible. Nevertheless, when all is said, *Merchant Airmen* is a worthy, although all-too-short tribute to a very gallant body of men and women. C. S. W.

"The A.B.C. of Practical Astro-Navigation," by R. K. Vanderword. Pitman and Sons, Ltd., 6s.

OF the large number of trained air navigators existing to-day, the majority will have gained their knowledge and experience in the R.A.F., and in view of the conditions of operation and the special aids to navigation available, they will have made little use of astro shots. Unless it is in regular use, knowledge of astro-navigation very quickly becomes rusty.

In his foreword to *The A.B.C. of Practical Astro-Navigation*, Capt. H. F. Chase says, "When in flight, and maybe under trying conditions, there is no time to pause and consider the next step in the calculation—the work must become a habit born of experience. The object of this book is to provide just this experience."

The book is recommended for those who wish to brush up their practical astro-nav., or who wish to study it for the first time with the minimum of mathematical effort.

"The Story of the Air Training Corps" Edited by Leonard Taylor; Rolls House Publishing Co., Ltd., 3s.

PUBLISHED for the Air League of the British Empire, this well-produced book contains between its strong board covers a record of the A.T.C. which is at the same time a tribute to its work, and it is an admirable substitute for the official book on the Corps which ought to have been compiled but has not yet appeared. Perhaps "substitute" is not a sufficiently appreciative word, for no official record would be likely to appear in more attractive, well-illustrated guise.

The Editor of *The A.T.C. Gazette*, Mr. Leonard Taylor, has gathered into this publication a series of contributions by a number of Service and civilian personalities whose energy and enthusiasm for the Corps has long been known and appreciated by its members; between them they cover every phase of this national organization which made such a vital contribution to victory. Altogether more than 500,000 people have played their part in the work of the Corps, including some 40,000 officers, instructors, committee members and other helpers, to whom Marshal of the R.A.F. Lord Tedder pays tribute in his foreword. "It is peace with teeth," says Lord Tedder, "and the R.A.F., and the A.T.C., still has a job to do."—N. D. R.

SERVICE AVIATION

"Flight" photograph.

PLAN FOR THE FUTURE : An underside view of the new Armstrong Whitworth 52-G glider developed from ideas tested in the 52-G. Future bombers may well be

Royal Air Force and Naval Air Arm News and Announcements

New Air A.D.C.

AIR MARSHAL SIR RODERIC HILL, K.C.B., M.C., D.F.C., has been appointed Principal Air Aide-de-Camp to the King. He succeeds Air Chief Marshal Sir Edgar Ludlow-Hewitt, G.C.B., G.B.E., C.M.G., D.S.O., D.F.C.

British Cameras for R.C.A.F.

THE Royal Canadian Air Force has ordered 24 Williamson O.S.C. Mark I cameras, valued at £1,200 each.

The new cameras will be used for an extensive aerial survey and will probably be installed in the aircraft of two R.C.A.F. squadrons stationed at Rockcliffe, Ontario.

It is believed that in the O.S.C.-I. Williamsons have produced the most advanced ordnance survey camera in existence. Each exposure is nine inches square and, in addition to the normal information automatically registered on the film margin, the inside and outside temperatures are also recorded.

Civilian aerial survey companies in Australia and South Africa are negotiating for the purchase of a number of the cameras. A description of the O.S.C.-I appeared in *Flight* of July 26th, 1945.

Demobilization

THE Air Ministry has announced the advance release programme for June and July. The average release group for ground airmen will be 39. The general level of W.A.A.F. releases is group 47, and that of airmen aircrew is raised to group 44.

Aircrew officers of groups 39 to 43 inclusive will be released; for W.A.A.F. officers the average is 46. Ground officers' general release level is group 37.

There will be unavoidable variations in the release of certain employments, in which it has not been possible to make good shortages by training other personnel.

Appointment

AIR VICE MARSHAL S. M. MACDONALD, D.F.C., has been appointed Air Officer Commanding No. 11 Group, Fighter Command.

Air Chief Marshal Sir Douglas Evill, G.C.B., K.C.B., D.S.C., A.F.C., who retires from the R.A.F. on June 1st. He will be succeeded as Vice-Chief of the Air Staff by Act. Air Marshal Sir William F. Dickson, who is at present Asst. C.A.S. (Policy).

Medical Appointment

THE KING has approved the appointment of Air Vice-Marshal Kenneth Biggs, C.B.E., M.C., as an Honorary Physician to His Majesty in succession to Air Marshal Sir Harold Whittingham, K.C.B., K.B.E., who vacates the appointment on retirement from the R.A.F. Air Vice-Marshal Biggs is principal medical officer at H.Q. Air Command, South-East Asia.

Disarmament in Austria

STARTING with a Baedeker guide and a map of Central Europe, the Air Division of the Allied Commission, Austria, started planning disarmament seven months before the Austrian collapse on May 8th, 1945.

The Air Division, after

leaving Rome, is now established near Vienna in the incomparable Schonbrunn, summer palace of the Hapsburgs. No. 700 Wing, who carry out the plans, have headquarters in Bruck, and the squadron headquarters are at Lannach, near Graz, Aigen-bei-Worschach, Klagenfurt, Zeltweg and Vienna. Although hampered by the extreme degree of dispersal caused by Allied bombing, they have uncovered literally millions of items of *Luftwaffe* war material.

Each squadron was given an area of the British Zone in which to disarm airfields, to locate and examine factories, and to pick up clues leading to anything concerning German Air Force property. By the end of December the following items had been discovered: 384 complete aircraft, 107 airframes, 160 tons of bombs, 64 gliders, 850 airscrews, 600 aero-engines, 9,000 instruments, and 23 ground and 125 airborne Radar installations.

One grim relic of the war are Vienna's four sets of huge twin flak towers, nine storeys high.

These massive blocks of solid concrete contained vast air-raid shelters on the three lower floors, a complete air-conditioning plant, shadow factories and hospitals. One of each pair was topped with a giant Wurzburg radar control which operated the four pairs of 12.8 cm anti-aircraft guns on the other. Gun crews and radar operators lived in the towers, which were protected by walls 21 feet thick, built of 50,000 cubic metres of concrete reinforced with 25,000 tons of steel.

Roll of Honour

Casualty Communiqué No. 579.

THE Air Ministry regrets to announce the following casualties on various dates. The next-of-kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Of the names in this list, 240 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Lt. L. N. Collins; F/O. R. H. Hurn; F/O. J. F. A. Neal.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. F. V. Bainbridge; Flt. Sgt. J. Coles; Flt. Sgt. J. F. Dormer; Flt. Sgt. E. W. Fletcher; Sgt. A. W. Hall; F/O. H. W. Hazell, D.F.C.; F/O. O. M. C. Jones; Sgt. D. E. Martin; Flt. Sgt. J. W. Milburn; P/O. S. Sellers; F/O. M. J. Shenton; Flt. Sgt. W. J. Sheppard; W/O. D. G. Venn.

MISSING.—F/O. E. R. Ball; Flt. Sgt. W. Bernard; Flt. Sgt. G. L. Lennox; L.A/C. W. H. Richardson; F/O. G. A. Stewart; Sgt. W. Stewart; L.A/C. W. R. Taylor; W/O. J. V. Willis.

KILLED ON ACTIVE SERVICE.—Sgt. R. A. Alexander; Sgt. A. F. Betts; Sgt. A. E. Bonass; F/O. S. H. Bunting; F/O. Lord R. A. S. G. Calthorpe; F/O J. Cantle-Jones; F/O. C. T. Dillon; A/C.1 H. R. Goulding; W/O. A. Griffiths; F/O. H. K. Griffiths; F/O. J. C. Jackson; Sgt. J. D. Lamb; W/O. V. G. Last; Flt. Lt. D. W. Lee; Flt. Sgt. H. J. Lintott; Flt. Sgt. P. D. McClemont; A/C.1 J. McWilliams; Flt. Sgt. R. C. Maiden; Cpl. E. V. Maltby; L.A/C. J. Mitchell; Flt. Lt. R. E. Pratt; W/O. E. A. Pether; F/O. K. R. Pullan; Flt. Sgt. E. S. Seligmann; L.A/C. J. E. Simcock; Flt. Sgt. J. E. Timms; Sgt. R. B. Viall; Flt. Sgt. D. Wareham; L.A/C. S. G. Wordsworth; Flt. Sgt. P. W. Youngman.

WOUNDED OR INJURED ON ACTIVE SERVICE.—L.A/C. R. H. Buffrey; Sgt. J. D. Inglis; P/O. K. A. Thompson; Cpl. H. E. Warner; Sgt. F. W. Wookey.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—L.A/C. W. C. Gillon; Cpl. A. Leitch; L.A/C. A. G. Murless.

DIED ON ACTIVE SERVICE.—A/C.1 J. Alston; A/C.2 T. Anderson; L.A/C. G. S. Ashbee; Sgt. K. R. Aylett; L.A/C. D. C. Bevan; L.A/C. A. E. Booth; L.A/C. D. J. Bowen; Sgt. M. A. W. Brown; L.A/C. E. W. Bryant; A/C.1 H. A. Buhts; Cpl. W. Campbell; L.A/C. K. Charlesworth; W/O. A. E. Cheers; A/C.1 E. L. Clement; A/C.2 J. Collins; A/C.1 J. W. Crozier; A/C.2 G. A. Every; Sgt. E. K. Foster; A/C.1 H. Fozzard; A/C.1 P. J. Frith; L.A/C. H. A. Frost; Act. Cpl. K. H. Gerrish; L.A/C. H. C. Gilbert; A/C.1 J. R. Grant; L.A/C. H. A. Harris; F/O. L. A. T. Hawkey; A/C.2 J. Jackson; F/O. R. B. Jackson; F/O. P. A. Jacobs; L.A/C. T. E. J. John; L.A/C. G. D. Kirtley; Flt. Lt. F. E. Lewis; L.A/C. F. Lyons; W/O. D. McNeill; A/C.1 T. A. Martindale; A/C.2 A. Moore; L.A/C. A. Mullen; L.A/C. B. B. Newell; Flt. Sgt. T. W. D. Quainton; Cpl. R. F. Rooksby; F/O. V. H. Smith; A/C.1 C. R. Sparrow; L.A/C. J. P. Spencer; Sgt. H. J. Staddon; L.A/C. R. H. C. Tindle; Cpl. C. M. Walker; L.A/C. K. Wild; A/C.1 N. H. Williams; W/O. G. E. L. Wilson; A/C.2 J. C. Wilton.

Women's Auxiliary Air Force

KILLED ON ACTIVE SERVICE.—L.A/CW. A. A. Maltby; Sgt. H. V. Timms.

DIED ON ACTIVE SERVICE.—L.A/CW. J. M. Keddie.

Royal Australian Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Act. F/O. E. D. Alexander; Flt. Sgt. M. B. Blaubaum; Act. F/O. A. R. Bradley; F/O. A. J. Brady; Flt. Sgt. R. S. Camier; F/O. J. R. Delahunty; P/O. E. N. Devine; Flt. Sgt. G. R. Ferguson; F/O. G. E. Heath, D.F.M.; W/O. E. A. Hogan; Flt. Sgt. R. B. McCormack; Flt. Sgt. I. F. MacGugan; Flt. Sgt. J. McWhinney; Flt. Sgt. J. W. Perrie; Flt. Sgt. R. H. C. Peut; Flt. Sgt. K. W. Rust; F/O. J. A. Saint-Smith, D.F.M.; F/O. D. J. Sandell; Flt. Sgt. J. B. Ware; Flt. Sgt. D. V. Watson.

Badge of R.A.F. Maintenance Command—"Service."

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Flt. Sgt. P. G. Caddy; Flt. Sgt. R. Yabsley.

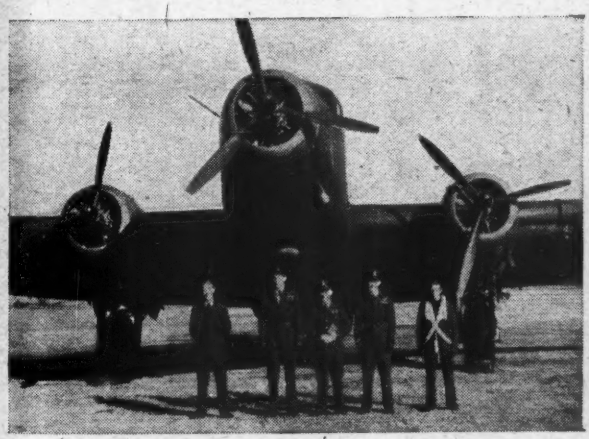
Royal Canadian Air Force

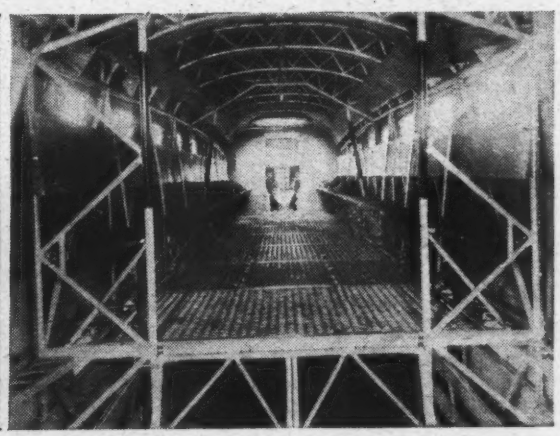
MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—F/O. D. S. Bowes; F/O. J. C. Cunningham; Flt. Sgt. R. A. Duncan; F/O. J. J. Gladish; Flt. Sgt. B. MacLennan; P/O. J. Rea; F/O. A. M. Taylor; Flt. Sgt. J. D. Walker.

MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Lt. J. A. Lukey.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—F/O. J. K. Armour; Flt. Lt. R. J. Audet, D.F.C.; F/O. L. J. Benville; Flt. Lt. W. F. Borrett; F/O. R. S. Edick; F/O. C. F. Harwood; P/O. C. A. Holmlund; P/O. E. A. Innes; Flt. Sgt. P. S. Jennings; F/O. A. Kotyk; F/O. F. T. Leithead; F/O. H. Lochhead; F/O. D. L. C. McCullough; Flt. Sgt. C. H. McInnes; P/O. R. W. McKinnon; Flt. Lt. H. T. Mossip, D.F.C.; F/O. G. L. Passmore; Flt. Sgt. J. M. Rae; F/O. E. Rhind; Flt. Sgt. J. A. Rinder; Flt. Lt. J. E. Sales; F/O. B. G. Simonin; Flt. Sgt. G. A. Smith; Flt. Lt. D. T. Steele; Flt. Lt. J. A. Thuriow.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. J. C. Adams; F/O. V. R. Adams; Flt. Lt. F. C. Aldworth; F/O. J. Allan; P/O. W. E. Archer; F/O. D. J. Bailey; W/O. C. D. Beck; F/O. L. R. Belcher; F/O. H. Bloch; F/O. W. A. Booth; F/O. H. P. Breier; Flt. Sgt. F. N. Brown; Flt. Sgt. J. P. Brown; F/O. G. W. Byers; P/O. D. J. Campbell; Sgt. C. J. A. Cary; F/O. W. M. Chapman; Flt. Lt. W. C. Charde; Sgt. L. J. Collinson; F/O. E. W. Connolly; P/O. F. A. Coombs; P/O. J. C. Copeland; P/O. G. P. Coughlin; Sqn. Ldr. N. Crawford, D.F.C.; F/O. J. P. L. Cullen; F/O. F. H. Cummer; F/O. H. R. Dart; W/O. J. A. Dickson; F/O. A. A. Dixon; Flt. Sgt. W. J. Doherty; F/O. R. A. Ebber; F/O. R. Edge; F/O. W. R. Elcoate; F/O. S. W. Elgie; P/O. P. F. English; P/O. J. G. M. Fisher; F/O. G. Floyd; Flt. Sgt. L. O. Foisy; Flt. Sgt. T. A. Gabriel; Flt. Sgt. H. Gallagher; F/O. G. E. Geeves; Flt. Sgt. J. R. Giblin; Flt. Sgt. W. J. Glass; Flt. Lt. H. S. Glassco; P/O. L. T. Graham; F/O. J. W. Green; F/O. K. G. Gutensohn; F/O. B. E. W. Hall; F/O. C. W. Hall; F/O. C. E. S. Hamlyn-Levis; W/O. D. Hanna; P/O. H. E. Harvey; P/O. G. Hay; F/O. S. D. Hewson; Flt. Lt. D. W. Hill; W/O. A. Hisette; P/O. L. E. Hoffman; P/O. F. E. Hogan; Flt. Lt. J. P. O. Howard, D.F.C.; F/O. F. Hyde; F/O. B. D. Hyndman; Flt. Sgt. F. C. Irving; F/O. H. W. Johnson; Flt. Sgt. R. J. H. Johnstone; W/O. A. M. Jones; Flt. Sgt. W. H. Jones; Flt. Sgt. J. F. Kavizs; Sqn. Ldr. H. L. Kay; Flt. Sgt. R. E. Kearney; F/O. D. S. Kemp; Sgt. J. L. Keown; F/O. W. Kerluk; F/O. J. Klatman; Flt. Lt. J. K. Knights, D.F.C.; F/O. J. F. Lawless; F/O. A. T. Leblanc; W/O. J. R. Lee; F/O. G. J. Liney; Sgt. D. E. Linington; Flt. Lt. T. McAleese; Flt. Lt. E. B. McCutcheon, D.F.C.; F/O. K. O. McDivitt; F/O. J. A. F. McDonald; Flt. Sgt. P. R. Mogridge; F/O. T. P. McHale; Flt. Sgt. A. G. McKay; F/O. K. J. McLean; Flt. Sgt. J. W. McLeod; Flt. Sgt. K. C. McMurchy; Flt. Lt. E. S. Maguire; P/O. D. L. Marcellus; P/O. B. W. Martin; Flt. Sgt. E. D. Mathison; P/O. T. Metcalfe; F/O. M. A. Mills; Flt. Lt. C. S. Moir; Flt. Sgt. B. E. Moreau; Sgt. W. J. Morgan; Sgt. J. H. M. Murphy; Flt. Sgt. H. A. Neal; Flt. Sgt. E. S. Neil; Flt. Sgt. O. F. Newton; F/O. F. J. Nickerson; Flt. Sgt. R. A. Nisbet;





TRI-MOTOR TRANSPORT: On the left is one of two Savoia-Marchetti 82 bombers, found derelict on a German airfield, which have been pressed into service as transports with No. 84 Group Communications Squadron. (Right) The interior of one of the S.M. 82's.

P/O. S. L. Norejko; F/O. H. J. S. O'Brien; F/O. D. B. Olson; F/O. B. A. Parker; F/O. W. N. Patterson; F/O. E. F. Patzer; Flt. Sgt. J. Pennington; Flt. Sgt. R. F. Piercy; F/O. J. M. Prentice; Sgt. R. A. Quinn; P/O. T. P. Quinn; F/O. E. E. Reaney; P/O. C. J. Roberts; Flt. Sgt. W. G. Roberts; F/O. J. T. Robinson; F/O. V. S. Roy; Flt. Sgt. H. M. Rumball; P/O. S. G. Rundle; Flt. Sgt. E. R. Savage; Flt. Lt. A. F. Scheelar; F/O. G. Scott; P/O. I. W. Shantz; F/O. J. D. Sharples, D.F.C.; Flt. Lt. E. B. Sheehy; F/O. G. H. P. Shephard; Flt. Sgt. D. E. Sherman; Flt. Sgt. R. C. Shilliday; P/O. R. L. Stewart; Sgt. R. G. E. Silver; Flt. Sgt. R. J. Simpson; Flt. Sgt. G. E. Smith; F/O. M. A. Smith; Flt. Sgt. V. B. Smith; Flt. Lt. E. Spankie, D.F.C.; Flt. Lt. L. G. Sparling; F/O. G. D. Spencer; F/O. L. W. Splatt; P/O. A. W. Staves; P/O. T. A. Stone; F/O. S. A. Tafler; Flt. Lt. G. O. Tedford; P/O. B. S. Thompson; P/O. C. S. Thomson; Flt. Lt. G. H. Thomson; P/O. D. Turner; F/O. W. B. Turner; Sgt. R. R. Vallier; Flt. Sgt. D. Veri; Flt. Lt. A. J. Vickers; Flt. Sgt. W. W. Wagner; F/O. C. Walford; P/O. J. M. Wallace; F/O. R. M. Wallis; F/O. D. Watson; F/O. L. Webster; F/O. J. G. Welk; F/O. G. D. Wilson; Flt. Sgt. S. E. Zadorozny.

MISSING.—F/O. T. B. Little.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—P/O. G. L. Mullhall; F/O. W. A. Tustin; P/O. J. W. Wettlaufer.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—F/O. A. K. Deakin; F/O. R. W. Evans; P/O. E. B. Ross.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—W/O. R. W. Beck; Flt. Sgt. L. G. Calman; P/O. J. C. Chalmers; Flt. Sgt. R. C. Chesterman; Flt. Lt. B. M. Hynes; Act. F/O. J. A. McIntosh; F/O. A. M. Penman; P/O. L. P. Searell; Act. Flt. Lt. J. M. Shearer.

South African Air Force

KILLED ON ACTIVE SERVICE.—Air Mech. H. F. Taljaard.

Casualty Communiqué No. 580

Of the names in this list 248 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Flt. Lt. J. Fisher; F/O. J. L. Osler.

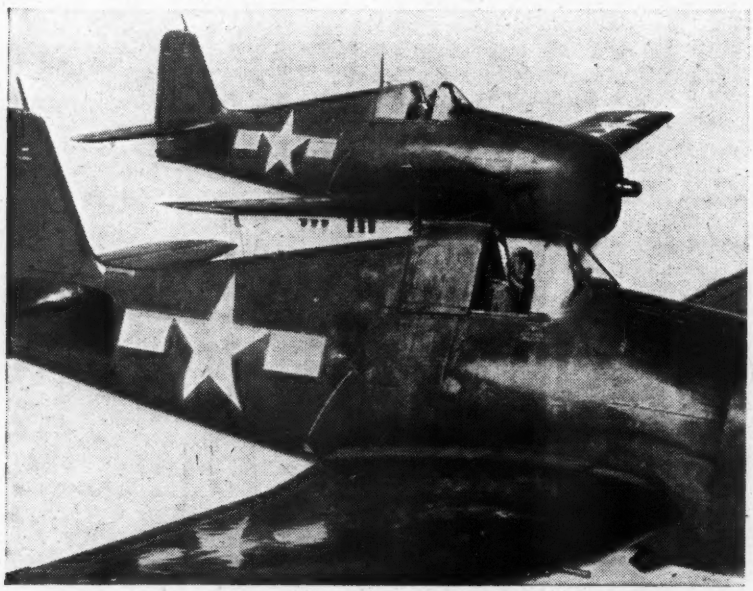
MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. R. H. Hughes.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. J. Coull.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—W/O. R. G. Abraham; Sgt. J. H. M. Adam; Sgt. R. Ainsworth; Flt. Sgt. R. G. Allen; Sgt. L. A. Andrews; Sgt. N. A. Atkins; Act. Wing Cdr. R. A. Atkinson, D.S.O., D.F.C.; Flt. Sgt. W. F. Beary; Flt. Sgt. E. Bennett; Sgt. E. S. Bicknell; F/O. W. Birkin; F/O. J. E. Bodenham; F/O. E. Bolton; Sgt. E. Booth; Sgt. R. C. Bowden; Sgt. G. W. Brown; Sgt. R. A. Brumwell; F/O. R. McN. Buist; Sgt. E. Campbell; Sgt. W. Carter; Sgt. J. R. Chambers; Flt. Sgt. R. Charles; F/O. G. L. Churcher; Sgt. H. W. Clarke; Flt. Sgt. C. H. Cockram; Sgt. R. C. Coley; Flt. Sgt. S. Cole; Sgt. J. C. Constable; Sgt. E. K. Corcoran; Sgt. J. Crosbie; Sgt. M. H. J. Curtis; Flt. Lt. W. E. M. Dean; Sgt. T. A. Dennett; Sgt. N. W. Dorling; Sgt. R. P. Duncombe; F/O. N. J. Dusson; Sgt. H. N. Eato; Sqn. Ldr. B. O. Egan-Wyer; Sgt. N. Elvish; Sgt. A. D. Etheridge; Flt. Sgt. R. S. Evans; Flt. Sgt. L. E. Ewing; Sgt. B. Fagan; Sgt. L. W. Fiest; Sqn. Ldr. R. H. Franklin; Sgt. J. Gerrard; Sgt. T. Greener; Sgt. E. Haigh; Sgt. E. Haines; Sgt. J. Haley; Flt. Sgt. R. Harland; Flt. Sgt. F. H. J. Harris; Act. Flt. Lt. P. N. Herbert; F/O. L. M. Hesketh; Sgt. R. Heugh; Sgt. W. F. G. Higgs; Sgt. R. J. Hogg; F/O. H. O. Hollis; P/O. K. H. Jackson; Sgt. R. F. O. James; Sqn. Ldr. A. H. Jarand; Sgt. J. H. P. Jibson; Sgt. L. Kennedy; Sgt. T. Kirkham; F/O. G. Laing; Sgt. J. D. Lakin; Sgt. W. Law; Sgt. C. Leeming; F/O. P. F. Lewcock; F/O. D. C. Lindsay; Sgt. J. P. Lynch; Sgt. J. McAinsh; Flt. Sgt. W. McCall; Flt. Lt. D. K. McCuaig, D.F.C.; Flt. Sgt. J. McEwan, D.F.M.; Flt. Sgt. J. MacFarlane; Sgt. J. McGuckin; F/O. J. McGurk; Sgt. E. L. McLaren; W/O. C. McLaughlin; Flt. Sgt. J. McLean; Flt. Sgt. R. C. Mahoney; Flt. Sgt. H. Martin; Flt. Sgt. D. W. Mason; Sgt. E. T. Mason; P/O. A. L. Mayers; F/O. L. G. Mead; Sgt. G. E. Milton; Sgt. N. B. Molyneux; Sgt. I. M. Morganstein; Sgt. J. Morley; Flt. Lt. G. E. Nicholls; Flt. Sgt. P. A. Noel; Sgt. J. D. C. Noonan; Flt. Sgt. J. W. Norman; Sgt. A. B. O'Connor; F/O. E. W. Osborne; Sgt. H. G. Pallett; Flt. Sgt. F. Papple; Act. Wing Cdr. G. R. Park, D.F.C.; Flt. Sgt. J.H. Parry; P/O. G. A. Payne; Flt. Sgt. L. F. Payne; Sgt. D. H. Pemble; Flt. Sgt. R. Percy; Act. F/O. J. P. Perry; Flt. Sgt. J. W. Pilling; Flt. Sgt. C. L. Pollard; P/O. J. G. Pope; Sgt. J. Read; Act. F/O. D. W. Ready; F/O. F. S. Renton; Sgt. D. P. Richmond; Sgt. J. Robinson; F/O. J. R. Rosser; Act. F/O. H.A. S. Russell; Flt. Lt. J. Russell; Flt. Lt. N. B. Rutherford, A.F.C.; Sgt. G. J. Rutson; Flt. Sgt. A. G. Scarff; Sgt. W. P. Scott; F/O. I. G. Skelton; Sgt. J. M. Sloan; Sgt. H. G. Smith; F/O. P. A. K. Snell; Sgt. J. E. Speed; P/O. F. H. Stanbury; Flt. Sgt. B. Sterman; Sgt. W. H. R. Stevens; Sgt. R. Thew; P/O. G. H. Tindall; W/O. L. Tommie; W/O. C. E. Towhill; F/O. V. O. Upton; Act. Sqn. Ldr. T. Y. Wallace, D.F.M.; Act. F/O. E. Walton; Act. F/O. A. G. S. Watkins; Sgt. R. L. Watkins; Sgt. D. S. Watson; Sgt. P. Webb; P/O. J. L. B. Webster; Sgt. B. N. White; F/O. G. A. White; W/O. H. C. White; Sgt. L. G. Whybrow; Sgt. R. J. Williams; Sgt. H. R. Willicombe; Flt. Sgt. E. E. Wood; Flt. Sgt. R. Youngs.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—W/O. A. Adamson; Sgt. J. Devlin; Flt. Sgt. A. J. McKay; F/O. R. M. M. Strattan.

KILLED ON ACTIVE SERVICE.—Flt. Lt. E. F. Alexander; F/O. J. M. Benyon; Flt. Lt. A. S. Carswell; Cpl. S. S. Dicks; Flt. Sgt. H. W. Pethick; F/O. R. C. Rudkin; Flt. Lt. J. G. Seth-Smith; F/O. R. S. E. Verran, D.F.C.; Flt. Sgt. E. M. C. White; W/O. T. O. Williams.



TAME: Two Hellcats of the U.S. Navy on a training flight. All U.S.N. aircraft are now finished in a standard colour, attractively styled "midnight blue."

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WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. K. A. Chirgwin; F/O. R. Fussell; F/O. F. A. Pielou; Flt. Sgt. D. H. Radford; Flt. Sgt. C. F. Shepperd; Flt. Sgt. W. Smith; Flt. Sgt. H. Wasdell.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—F/O. W. McCracken; F/O. A. G. Page.

DIED ON ACTIVE SERVICE.—L.A/C. S. C. Angell; Flt. Lt. R. W. Armstrong; A/C.1 J. Beardsley; A/C.2 E. Bell; L.A/C. H. G. Bluck; A/C.1 C. C. Borrett; F/O. R. A. Y. Caruth; A/C.2 A. R. Cawsey; L.A/C. R. W. J. Clark; A/C.1 H. B. Clarke; L.A/C. P. R. Conway; L.A/C. G. T. P. Cope; A/C.2 J. I. Davies; A/C.1 G. T. Dennis; A/C.2 A. J. Down; L.A/C. J. D. Gray; L.A/C. H. Hayes; A/C.1 J. Heron; A/C.2 F. Hickson; A/C.2 S. F. Hollands; Sqn. Ldr. D. A. M. Hopkins; L.A/C. H. Howes; L.A/C. E. E. Hubbard; Cpl. F. Ingram; Cpl. R. S. James; L.A/C. A. C. Kirk; Sgt. A. C. N. Lambert; L.A/C. R. Latham; A/C.2 G. Leslie; A/C.2 A. A. Lewitt; A/C.2 H. Lindley; W/O. E. L. Littlewood; Cpl. H. W. Luck; L.A/C. R. McAulay; Cpl. J. R. Maggs; L.A/C. R. S. Manson; L.A/C. W. Marshall; Sgt. A. Mattinson; F/O. D. C. Meathrel; Cpl. S. F. Miller; L.A/C. W. Millar; L.A/C. H. J. Mudge; A/C.1 F. K. Newman; L.A/C. E. L. Parry; A/C. A. Patchett; A/C.2 C. Pearce; A/C.2 W. J. Porter; A/C.2 W. Richards; L.A/C. D. E. Riley; A/C.1 L. H. Rosser; A/C.1 W. E. Rowan; W/O. T. W. Sanders; A/C.1 C. A. Seal; L.A/C. P. G. Shannon; F/O. H. H. Siddell; L.A/C. K. F. W. Smith; L.A/C. F. Snaps; Cpl. G. E. Spears; A/C.1 A. E. Stannaway; P/O. P. S. Stephen; Sgt. W. G. Tadgell; A/C.1 R. J. Thomas-Waters; Sgt. R. E. Turner; L.A/C. D. G. Vinson; A/C.1 J. C. West; Act. Flt. Lt. H. O. Wilson; Flt. Sgt. W. J. Worth.

PREVIOUSLY REPORTED MISSING, NOW REPORTED DIED ON ACTIVE SERVICE.—F/O. G. Hood.

Women's Auxiliary Air Force

KILLED ON ACTIVE SERVICE.—A/CW.1 G. D. Harris.

DIED ON ACTIVE SERVICE.—L.A/CW. L. M. B. Edwards; L.A/CW. A. Leigh; A/CW.1 E. C. Redmond.

Royal Australian Air Force

PREVOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Flt. Sgt. J. M. Gerrard.

DIED ON ACTIVE SERVICE.—Act. Flt. Lt. N. I. Merrett, D.F.C.

Royal Canadian Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Lt. J. B. Doak.

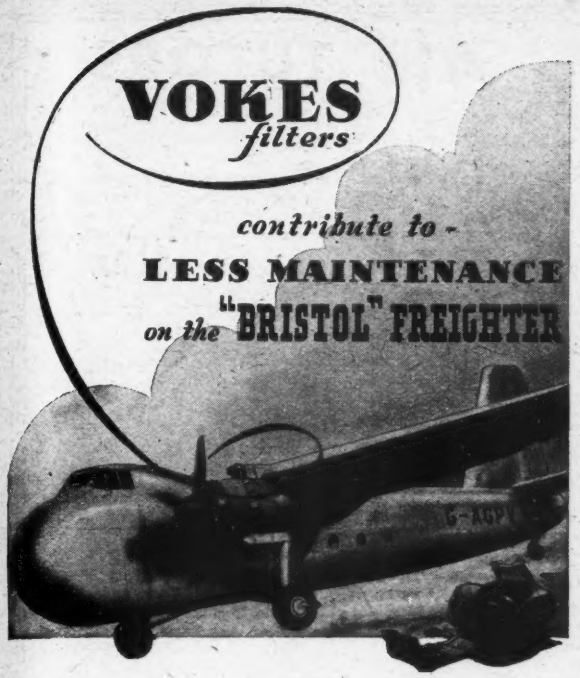
PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Lt. B. M. Adilman; P/O. P. Barnicke; Flt. Sgt. H. W. Botterill; Flt. Sgt. D. H. Brown; P/O. A. G. Carolan; P/O. H. A. Carruthers; F/O. H. D. Christie; P/O. E. S. C. Clark; Flt. Lt. W. H. Cook; F/O. G. R. R. H. Craib; Sqn. Ldr. B. G. Crew; W/O. R. K. Crow; P/O. H. G. Davey; P/O. E. A. J. Davies; Flt. Sgt. V. D. Elliott; F/O. R. H. Emerson; F/O. M. Emsig; F/O. N. G. Fadden; P/O. L. W. Ferguson; P/O. W. A. Flett; F/O. J. Fraser; F/O. H. S. Gartrell; P/O. W. J. C. Gibson; P/O. W. G. Gillissie; P/O. J. B. Grady; P/O. P. S. Greene; F/O. C. Gurevitch; F/O. R. McK. Habkirk; F/O. V. H. Halstead; P/O. J. R. Harper; F/O. R. T. Heeney; Flt. Lt. D. E. Hillman; Sgt. F. C. Hoxford; Flt. Sgt. O. H. Hudson; F/O. W. St. C. Huskilson; F/O. H. O. Irvine; Flt. Lt. L. K. James; Flt. Sgt. K. E. Kelly; F/O. C. Kelway; Flt. Lt. A. Kichlbauch; P/O. J. Kramer; Flt. Sgt. C. B. MacDonnell; Sgt. A. E. McGraw; Flt. Sgt. G. McGregor; F/O. A. M. Mackie, D.F.C.; F/O. M. A. MacLeod; Flt. Lt. D. B. MacNeil; F/O. T. McQuitty; P/O. W. G. Mann; P/O. W. D. Martin; Flt. Sgt. S. Mara; Flt. Sgt. H. E. Miell; F/O. P. G. Milburn; P/O. A. B. Miller; F/O. T. R. Murray, D.F.C.; Flt. Sgt. L. W. Nelson; F/O. R. J. Newman; P/O. J. H. Y. Nowlan; Flt. Lt. W. K. Parke; P/O. W. J. D. Partridge; Flt. Lt. R. N. Perdue; Flt. Lt. G. R. Pool, D.F.C.; W/O. O. J. Rau; F/O. E. W. Rech; F/O. A. J. Reeder; F/O. H. R. Reid; Flt. Sgt. L. E. Riggs; Flt. Sgt. J. R. Robertson; F/O. R. H. M. Rose; Flt. Lt. H. Russel; F/O. G. G. Shaw; P/O. E. Smith; Sgt. N. L. Smith; F/O. F. Stratford; Flt. Sgt. N. E. Stuttle; P/O. A. S. Thomson; F/O. N. R. Vatne; P/O. A. M. O. Walker; Flt. Lt. E. W. Watson; Flt. Lt. S. P. Whyte; P/O. W. T. Wilson; P/O. A. R. Wright.

PREVOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Flt. Lt. R. D. Guild; P/O. N. A. Smith.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Flt. Sgt. H. D. Hooper; Flt. Sgt. I. McKinnon; F/O. T. J. P. Magee.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sqn. Ldr. P. W. Rabone, D.F.C.; F/O. T. Wyllie.



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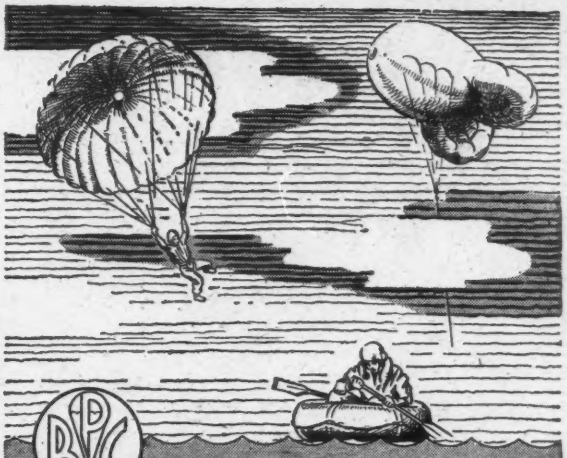

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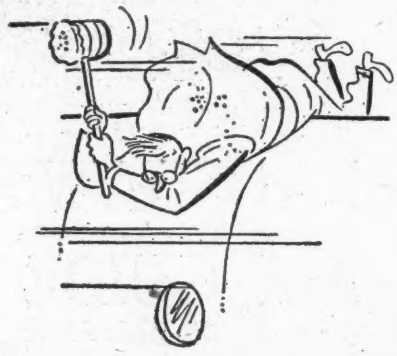

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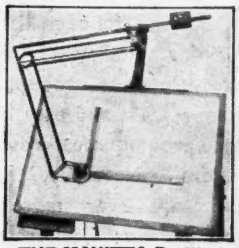

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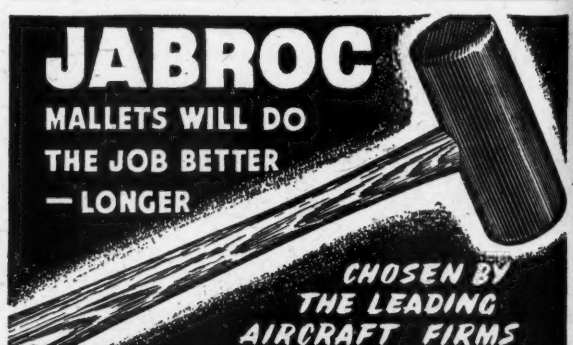

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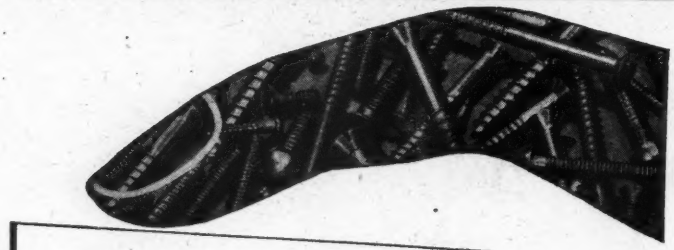

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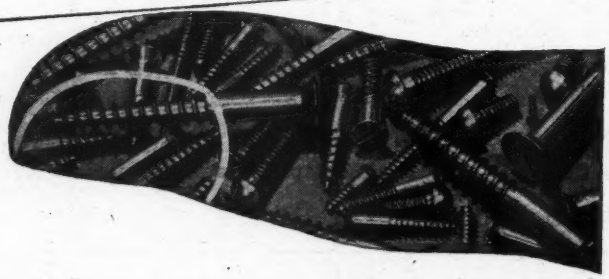

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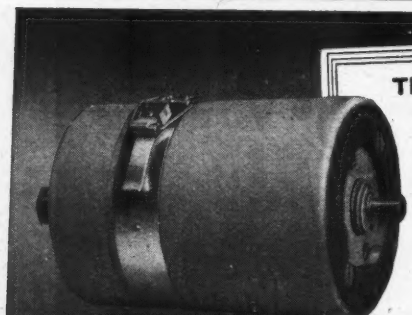

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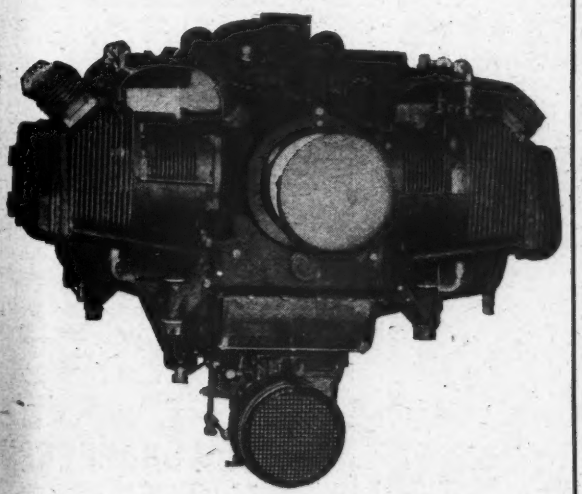

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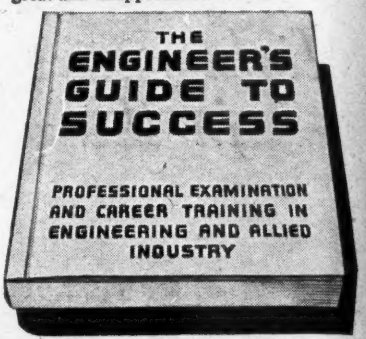

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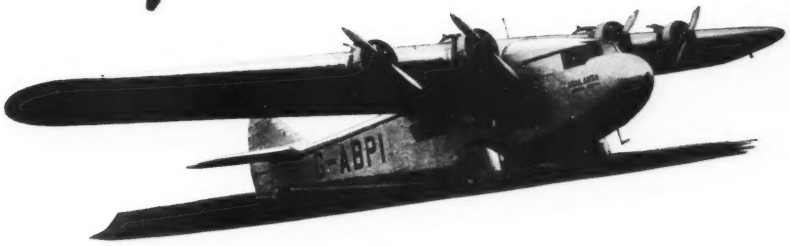

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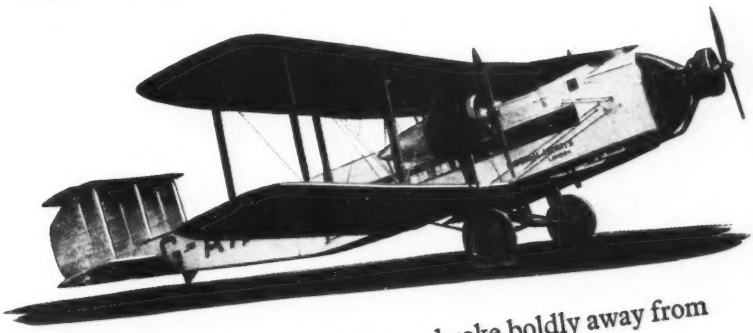

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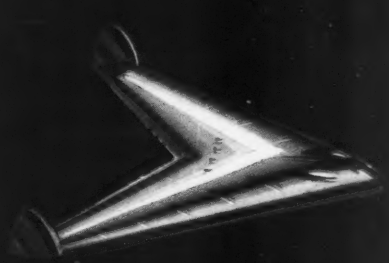

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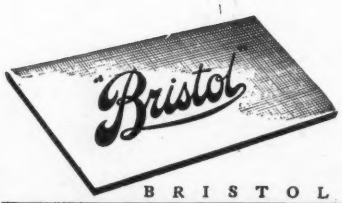

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